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THE CLASSIFICATION OF PUPILS IN ELEMENTARY ALGEBRA

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INTRODUCTION

In all that pertains to intellect it is constantly illustrated that individuals differ in the ability to acquire knowledge. This truth is axiomatic. All know that some learn slowly, others rapidly. By consulting any good treatise on psychology one may find a useful discussion of these differences in mental traits and their causes; but one would not be so well rewarded if he should seek an account of the effects which these differences in ability to learn have individually and collectively on the members of a group.

In this article the latter phase of the matter will receive emphasis. I shall be concerned largely with such questions as:—(a) Is there any advantage in learning rapidly? (b) What effect does the slow learner have on the class work? (c) How much benefit does the slow pupil receive from the class work? (d) How much does the bright pupil receive? (e) What effects do the slow pupils have on the work of the bright pupils? (f) What effect does the bright pupil have on the slow one? (g) What are some of the conditions under which the best work for an individual can be accomplished? (h) What are some of the methods set forth for the solution of these problems?

My findings in some respects agree with the findings and opinions of others, but in several cases they are the reverse of popular and traditional opinion.

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In a large high school in Minnesota during the school year 1911–1912, the material for this article was gathered by the writer from his classes in beginning algebra as follows:

Each pupil was given a card upon which his or her daily record was kept according to the following items: (1) Name. (2) Date. (3) Period of recitation. (4) The daily assignment. (5) The number of problems solved correctly. (6) The number of problems solved incorrectly. (7) The time to the nearest five minute period spent outside of the recitation in preparing the lesson. (8) The grade in per cent. made on the assignment.

Several precautions were taken to secure normal and trustworthy data. The more important of these were:

(1) The pupils at no time understood that the material was to be used for the present purpose; but on the other hand they treated it as a part of their regular school work from which they would not profit except by getting the habit of checking their work, and learning how to use time to the best advantage in preparing lessons.

(2) The assignments were selected from the exercises in *Wentworth's New School Algebra,* and are accordingly numbered in this article. In the main these were drill exercises; they were assigned after the theory by which they were to be solved had been carefully studied in class. The theory was never assigned for an advance lesson. These precautions insured that each pupil knew how to proceed with the assignments.

(3) Each pupil was urged to work alone at a regular time, at a maximum rate of performance, and under his or her normal conditions.

(4) The time was kept to the nearest five minute period by the pupils. Uniformity in keeping correct time was insisted upon on the ground that they would learn to be more careful and accurate with their own work. Their honor was appealed to in this matter. The writer feels that the time element is as accurate and reliable as it is possible to obtain from normal and conscientious pupils.

(5) The pupils brought daily to the class written solutions of the problems. After these were graded by the class the daily record cards were made out and taken up along with the written work, which was afterwards graded by the writer to see that no mistakes had been made, and to secure uniformity in grading.

The Determining Factors in Selecting the Cases

The cases considered in this article are a selection of seventy out of one-hundred seventy pupils ranging in age from thirteen to nineteen years, representing many nationalities, and various economic and social conditions of home life. In fact the selection truly represents a cosmopolitan group of American high school pupils assembled from various wards and types of schools.

The agencies by which the selections were made were rather negative; some of them were: (a) Absence from class for a long period. (b) Failure to be regular in keeping records. (c) Failure to put forth a constant, and individual effort according to the pupil's ability.

Any one of these objections was sufficient to eliminate a case from the selection.

Special effort was taken to secure characteristic representatives of the work done in high schools. When a pupil missed a regular lesson he was given an extra lesson involving the same theory and required to make it up under the class restrictions. Thereby a very good record was obtained in the cases of absentees, and as the chronic absentees were eliminated from the selection, the few cases of absences included in this article would have no appreciable effect on the results of this paper.

The Treatment of the Material

In all there were sixty-six (66) exercises selected which are herein numbered accordingly. For each of these exercises each pupil handed in a daily record card from which a tabulation according to sequence of date was made showing the number of minutes spent and per cent. made on each assignment by each pupil. All the following tables and graphs are derived from this tabulation which for convenience we shall call reference tabulation, and which is too large to print. Great care was taken to make this table accurate.

Accuracy and Rapidity

Table I.

What relation is there between the very desirable traits of accuracy and rapidity? Nowadays we hear a great deal of discussion about them, most of which is not concrete.

Below is a table derived from the reference tabulation showing the classification as to grades, corresponding intervals of time, and distribution of numbers in each group.

	A or 100%	B or 86%–99%	C or below 86%
Total No. of cases making...	2234	1037	1349
Or reduced to per cent. of whole no. of grades.....	48.3%	22.4%	29.3%
Av. per cent.....	100%	92.1%	75.5%
Av. T.....	38.5 min.	47.1 min.	52.77 min.
Av. T'.....	38.5 "	51.2 "	77.98 "
Av. additional time of finishing the assignments.....	6 "	4.1 "	25.22 "

Av. T stands for the average actual time spent in preparation of the lessons outside the class by the pupils.

Av. T' stands for the average actual time required for complete mastery of the assignments, supposing that the pupils continued at the rate determined by the work they actually accomplished.

A comparison of the various groups as to their accomplishments and time intervals will clearly show that the A group accomplished more in less time than either of the other groups, which definitely indicates that speed and accuracy go hand in hand.

In some of the exercises (8 in all) apparent variations are found. These variations can be easily accounted for on the ground that the poorer and slower pupils get tired and become discouraged in a shorter time than the more accurate and more rapid pupils when they have a long lesson whether easy or difficult. The poorer and slower pupils due to the lack of incentive and satisfaction accompanying the overcoming of difficulties, become satisfied to stop work after they have spent a certain amount of time, or have obtained solutions for a certain portion of their assignments. In fact they become satisfied with a lack of mastery, and set for their goal the passing mark, which is a very damaging attitude for mental growth. Guided by this motive and standard the poorer pupils consciously or unconsciously set a maximum time over which they will not work. From this we readily see that these apparent variation are not real exceptions, but they too emphasize the same thing that the other exercises emphasize.

Instead of comparing the T columns we should compare the T' columns; at once it would be apparent that the C group did not show any ability to master the assignment in a shorter time than either of the other groups. The A and B groups set for their goal the mastery of the lesson. Thus they will persevere until they have either mastered or completely solved the problems assigned, regardless of the length of time required. From this it is readily

seen why the brighter pupils will, if necessary, put in more time to master the work than the poorer will in order to partially master it. The point might be made clearer by an illustration. For instance take a difficult exercise as 67, in which the A and B groups each on an average spent 76 minutes, while the C group spent 70 minutes. This is a significant fact when it is noticed that the C group were satisfied with their efforts at the end of 70 minutes, whereas it would have taken them at their rate of work 93 minutes to have mastered the assignment. They were ready to stop 23 minutes before they should have, while those in the A and B groups in order to completely master the work were willing to continue 6

TABLE II

	A.		B.				C.			
Time in 5 min. intervals.	Distribution of cases according to actual time spent in prep.		Distribution of cases according to actual time spent in prep.		Distribution of cases according to the time required to completely master the assignments		Distribution of cases according to actual time spent in prep.		Distribution of cases according to the time required to completely master the assignments	
	(1) cases	(2) av. time	(3) cases	(4) av. time	(5) cases	(6) av. time	(7) cases	(8) av. time	(9) cases	(10) av. time
20–25	49	22	0	0	0	0	0	0	0	0
26–30	47	27	14	29	14	29	12	28	0	0
31–35	40	33	15	34	11	32	11	33	12	39
36–40	30	38	15	37	17	38	11	38	10	43
41–45	29	43	14	42	15	43	17	43	9	47
46–50	27	47	19	47	16	48	23	49	12	53
51–55	26	53	18	54	18	53	22	52	16	59
56–60	20	58	13	58	19	59	25	58	18	64
61–65	21	63	16	63	12	63	28	64	21	69
66–70	17	66	0	0	16	68	28	68	18	73
71–75	24	74	18	73	18	72	20	71	32	79
76–80	24	76	14	76	18	79	0	0	26	83
81–85	0	0	6	83	14	84	0	0	28	89
86–90	0	0	0	0	0	0	0	0	25	92
91–95	0	0	0	0	0	0	0	0	29	101
96–10	0	0	0	0	0	0	0	0	0	0
100–105	0	0	0	0	0	0	0	0	0	0

minutes longer than the C group. Evidently we are safe in concluding that the most accurate pupils are the most rapid performers, and also their maximum length of time for accurate work is greater than that of the slower and less accurate.

It should be noticed as significant that pupils are capable of doing accurate work at their maximum rate for a period of 75 or 76 minutes. It will not be understood that a beginner could work for this length of time from the first, but as he advances in a study the length of time at a maximum rate of work can be increased by practice.

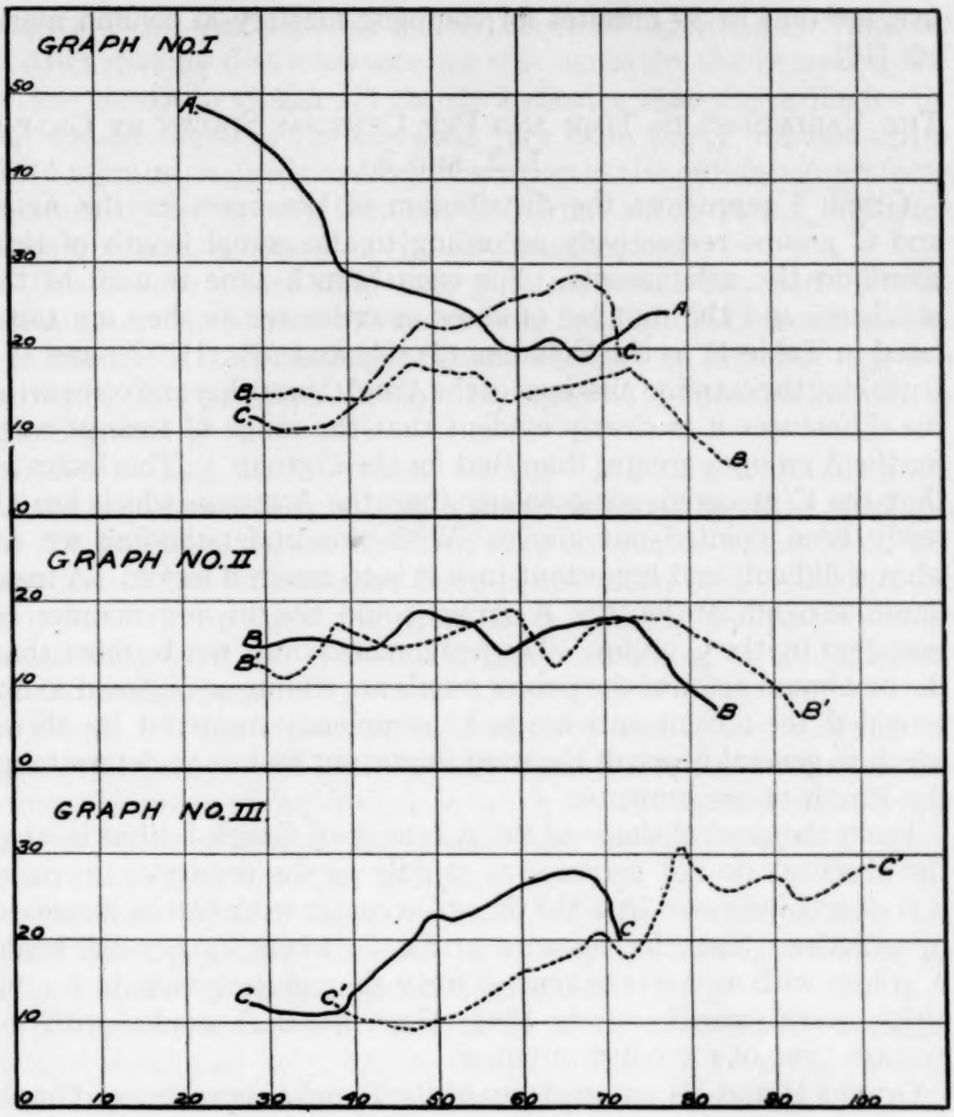
THE EXPLANATION OF THE FORMATION OF TABLE II

Table II is a tabulation of the average number of cases in each of the groups at an average time taken in intervals of five minutes each. In order to clarify, an illustration is here inserted. From the reference tabulation all the cases in the A group who were able to do their assignments within the interval between 20 and 25 minutes are found in:

(1) Ex. 9—54 cases with an average time of 20 minutes.
(2) " 15—42 " " " " " " 25 "
(3) " 39—45 " " " " " " 22 "
(4) " 42—54 " " " " " " 22 "

Thus for the four exercises above considered there are 105 cases, or an average of 49 cases for each exercise, and for the same exercises a total time of 89 minutes, or an average of 22 minutes for each. For the three groups the same classification was carried out and respectively tabulated under the proper headings as illustrated above.

Take for instance the time interval 36—40 minutes in the A group, Table II; we find 30 cases in column marked (1) with an average time of 38 minutes in column (2). Since the A group completely mastered the assignments in the preparation, the columns indicating required time for a complete mastery are the same as those for preparation. For the same interval there are under the B group 15 cases in column marked (3) with an average time of 37 minutes for their actual preparation in column marked (4), while for the required time for a complete mastery there should have been for this interval 17 cases in column marked (5) with an average of 38 minutes in column marked (6). In the C group there are 11 cases in column marked (7) with an average time of 38 minutes for actual preparation in column marked (8), while there should



In Graph 1 the distribution of groups A, B and C are indicated according to their actual performance. In Graph 2, B indicates the distribution of group B according to actual performance and B′ the same group according to required performance for complete mastery. In Graph 3, C indicates actual performance and C′ the required performance for complete mastery.

have been for this interval 12 cases in column marked (9) with an average time of 39 minutes for complete mastery in column marked (10).

The Variations in Time and Per Cent. as Shown by Graphs 1, 2, and 3

Graph 1 represents the distribution of the cases for the A, B, and C groups respectively according to the actual length of time spent on the assignments. For each branch time is used as the abscissas, and the number of cases as ordinates as they are tabulated in Table II in the Columns (2), (4) and (8), (1), (3), and (7). By taking the extreme abscissas of the A and C branches and comparing the differences it is clearly evident that the range of time of work for the A group is greater than that for the C group. This indicates that the C group gives up sooner than the A group, which has already been pointed out above. With this understanding we see what a difficult and important task it is to assign a lesson. A maximum assignment for the A group could not in any manner be mastered by the C group. The assignments must not be more than the maximum amount the poorer pupils are willing or disposed to do, provided the assignments are to be completely mastered by them, which in general is one of the most important factors in determining the length of assignments.

From the general shape of the A branch of Graph I (that is, that the abscissas do not decrease as rapidly as the ordinates increase) it is clearly indicated that the time of accurate work can be increased by practice. Take for instance in Ex. 20 where twenty-one made A grades with an average time of forty-six minutes, while in Ex. 92 after several months study thirty-three made A grades with an average time of forty-five minutes.

Graphs II and III are made up of the B and C branches of Graph I, together with branches made in a similar manner by using columns (5), (6), (9), and (10) of Table II for the added branches, columns (5) and (9) being used for ordinates and (6) and (10) for abscissas.

It must be borne in mind that there is not a one-to-one relation between the branches of these curves; for it has been shown that on an average the B group should have worked about five minutes, and the C group about twenty-five minutes longer in order to have completely mastered the work assigned. That is, in Graph III

an abscissa of 20 in the branch of actual performance would correspond to an abscissa of 45 in the branch of required performance.

After making due allowance for this variation the general shape of the curves in Graph III clearly indicates that the ordinates do not change much as the abscissas vary from thirty minutes up to forty minutes, a nearly uniform variation in the ordinate from forty minutes up to seventy minutes, and from there on the ordinates remain almost constant as the abscissas increase.

This in turn means that those pupils who are slow and inaccurate after a time become more and more fixed in the C group, and as the lessons or assignments increase in length or difficulty the less accurate they are until finally they become permanently fixed in the C group.

After making due allowance for the variations in the abscissas in the branches of Graph II, it is manifest from the slight variation of the ordinates as the abscissas take on various values from the smallest to the largest, that there is not much of a change in the B group except a slight shift from the A to the B, and just about an equal shift from the B to the C group according to the difficulty of the assignments.

Graph III also shows, when compared with I and II that the poorer become poorer more rapidly than the brighter improve, because the range of required time to master the assignments as time passes becomes longer and longer more rapidly for the C group than it does for the other groups.

The knowledge of these truths is not new to current lore, but their true significance has not attracted much serious attention for improvement in our actual school practice.

Everybody knows that when a team is overloaded the more the wagon is agitated by jerks, the deeper it sinks in the mire. Understanding this the teamster at once lightens the load and takes lighter loads. This could readily be done in school work provided all were in the mire or there were only one or two pupils to deal with. But when there are about twenty-five or thirty pupils with about as many different abilities it becomes a very different and difficult problem. It becomes a serious matter, when we view the school work from this angle, that the brightest pupils have no opportunity to work on assignments comparable to their abilities and that the poorer pupils set the standards and will not do any more than they are willing or disposed to do. The question of adjusting

the school work so that each pupil may receive the most good, becomes quite serious when we stop to ask how much should the brighter and by far the larger proportion of the pupils be hampered for the slower and less capable who profit little or none even by the assignment of work commensurable to their abilities.

The Effect of Grouping the poor and Bright Pupils in the Same Class

It has often been said that "Poor or dull pupils become animated and aroused in their studies by being associated with brighter pupils in classes." This assertion implies a beneficial relation existing between these two groups of pupils, or at least enough benefit is received by the poorer to over-balance the loss to the brighter by such classifications. Let us determine whether or not such a statement is well founded. Let us take up the question of effects the A, B and C group have on each other, when they are placed together in the same classes.

TABLE III

Groups	Av. Time Worked	Av. Time Required to make 100%	Per Cent made	Additional Time required to make 100%
A, or 48.3% of pupils	38.5 min.	38.5	100	0
B, or 22.4% of pupils	47.1 "	51.2	92.9	4.1 "
C, or 29.3% of pupils	52.77 "	77.98	75.5	25.21 "

From the above table it is evident that the A pupils do not require any additional time in order to correct mistakes made in their preparation. Therefore they do not necessarily receive any benefit from that part of the recitation designed for correcting errors. In the case of the B group since they did not completely master the assignments in their preparations additional time is required by them for correcting errors. It is noticed that this time is 4.1 minutes. Thus on the average the B group of pupils receive benefit for at least four and one-tenth (4.1) minutes from that portion of the class work designed for correcting errors and mistakes. In the case of the C group it is also noticed they failed to master their assignments and that an average of 25.21 minutes is required by them to complete the assignments and to correct errors made in preparation.

That is the time required, supposing the class work can be carried on at the same rate as that determined by the C group's preparation, which rate, by the way, is the slowest of the three groups. This class rate is not very likely to be equal to the preparation rate, because the wrong notions that have been formed must not only be eradicated, but new and correct ones must be formed to take their places. This is a much harder and slower process than to form the original conceptions correctly.

In so far as our American schools are organized on the assumption that each child shall be granted the right to have all his questions answered as well as time and a chance to completely master his work, it is clear how much the C group has a right to ask and expect.

We see then that the A group, 48.3 per cent. of the pupils, the brightest and most capable, has at least twenty-five minutes of its recitation time wasted, which is five eighths or 62½ per cent. of a forty minute recitation period. The B group, or 22.4 per cent. of the pupils, fares a little better. As the B group fails to completely master the assignment at least 4.1 minutes or about 10 per cent. of the recitation should be set apart for correcting errors. After this is done there is at least 20 out of 25 minutes set apart for corrections or 50 per cent. of the recitation period, from which the B group receives no benefit. The C group, alone, the poorer, the slower and the less capable, 29.3 per cent. of the pupils, has a chance to receive benefit for the full 25.21 minutes, 62½ per cent. of the forty minute recitation period, which the C group alone demands should be set apart for that purpose.

Thereby the only group of pupils that has a chance to work to a maximum, and it has been shown above they will not, is the C group, which in general does not have the mental energy, courage, desire or enthusiasm to inspire them. Thus ere long the work becomes a drudgery, and as a result this group drops deeper and deeper into the intricacies of the work with no hope of extraction.

It takes no argument to show that the brighter and more capable pupils lose daily from 20 to 25 minutes of a recitation, and that instead of receiving benefit for the full 40 minutes they benefit for 20 to 15 minutes. Nor is the loss of recitation time the total time loss to them. It has been pointed out above that they are able to continue accurate work at their maximum rate for a period of at least 76 minutes, and it has also been pointed out that their interval of voluntary work is longer than that of the C group which cannot

be urged to continue work more than about 52 minutes, which time is, in rough terms, about $^2/_3$ of 76 minutes or 66 $^2/_3$ per cent. of the length of time the brighter pupils will voluntarily work in order to master their assignments. Therefore we conclude that the brighter pupils are also handicapped in the amount of work they could and would willingly do in assignments if given an opportunity.

To be sure no one would likely hold that an assignment should require, under ordinary High School conditions, an hour and a quarter for preparation, but it is not an extreme either way to hold that the assignments should be sufficient in length or difficulty to keep the brighter pupils busy at their macimum rate of performance for at least 50 or 52 minutes, which is the average length of time the C group will work. Thus it is evident there is a loss daily in preparation of about fourteen (14) minutes to the A pupils and about five (5) minutes to the B pupils on the basis that the A pupils work 38 minutes and the B group 47 minutes on the assignments. Counting the loss to the A group in recitation 25 minutes and on assignments 14 minutes per day, we find that the brightest and most capable pupils lose daily 39 minutes, while the B group loses 20 minutes in recitation and 5 minutes on assignments which is a total loss of 25 minutes. On the basis that a pupil including preparation and recitation, should spend daily at least 90 minutes work at his or her maximum rate of performance, we see that the A and B groups are so hampered that they are not able to put in more than about $^2/_3$ or 66 $^2/_3$ per cent. of that time. To be accurate the A group, 48.3 per cent. of the pupils, is held back daily to an extent of 39–90 of the time, almost 4–9, or 44.4 per cent. of the time allotted to a subject, and the B group 25–90, 5–18 or 27.7 per cent. of the same time. From the above we are now safe in concluding that more than 33 1–3 per cent. of the time of 70.7 per cent. of the pupils is sacrificed for the 29.3 per cent. of the pupils.

Now after the sacrifice has been made, what are the final results? To be sure it does not make the C group anything other than the C group, for it has been pointed out above that they become more fixed in that station the longer they continue in such class conditions. Therefore, it is apparent that the popular opinion "That a poor pupil will receive inspiration and encouragement by being put in a class with bright pupils" is not well founded. The general rule appears to be that they do not so receive an uplift; but rather that they do not attain as much as they are actually able to do, notwithstanding the loss to the A and B groups.

In General the Poorer Pupils do not Profit by Being Put in Classes with Brighter Pupils

The following Table is a tabulation for ten cases selected according to the lowest examination grades.

TABLE IV

No. of case	Av. per cent. made on preparation	T	T′	Final test grades
	1.	2.	3.	4.
18	92	45	49	78
21	87	43	48	70
27	93	51	55	76
34	83	70	84	75
43	73	42	58	75
46	80	44	55	73
48	74	45	61	69
49	78	38	48	75
64	84	41	49	73
65	79	45	56	75
General Averages...	82.3	46.4	56.3	73.9

In a general way this selection represents the C group, and whatever is deduced from it will be true of the C group as a whole. It will be noticed at once; (1) that the preparation grades average 82.3 per cent. after they had spent on an average 46.4 minutes; (2) that these pupils on an average should have spent about 56.3 minutes in preparing their assignments. That in turn means 10 minutes, the difference between 46.4 and 56.3 minutes, should have been set apart in class for correcting mistakes made in preparation. In so far as 25 minutes per recitation were spent in correcting errors, it is evident that more time was spent for that purpose than was demanded by this particular selection. Under such a condition it would be fair to expect that this selection should have profited by that part of the recitation, and that their examination grades should indicate the benefit derived by being greater than their preparation grades, but contrary to expectation, the average examination grade shows an average decrease of 8.4 per cent. (82.3 per cent.—73.9 per cent.) from the average preparation grade.

This result points to the fact that the poorer pupils do not profit by that part of the class work given over to correcting errors,

as much as is generally supposed. The reason that they do not profit is very probably that the poorer pupils try to do work that is not commensurate with their normal abilities. This abnormal strain, under which they work, causes them to make a large number of improper associations. In the recitation these improper associations are not eradicated as is usually supposed. These wrong associations which have not been thoroughly corrected keep coming up in the mind, when the true associations are presented, until the pupils become more and more confused. This confusion causes them to rely on bare memory of the facts to carry them through, and as bare memory is not reliable, failure to master the subject is invited as the final result.

The points of this discussion emphasize the statement that poor pupils, in general, do not gain anything by being grouped with the brighter and more capable pupils.

The Most Capable as Well as the Less Capable Pupils Losf By the Present Prevalent Method of Classification

By use of Table V it is sought to show how the brighter pupils are retarded in their school work when put in classes with poorer and slower pupils.

In the following discussion it is assumed:

(1) That a grade made in a preparation (called a preparation grade) is a fair measure of a pupil's normal ability to acquire a mastery of a subject when working alone.

(2) That the grade made on examination, after the subject had been thoroughly discussed, is a measure of a pupil's actual mastery.

(3) That the difference between the examination grade and the preparation grade indicates whether or not a pupil's actual mastery is equivalent to his normal ability to acquire.

Table V is a tabulation of the examination grades and the preparation grades for the four selections, each consisting of twenty-three (23) cases. The fourth selection marked (w) comprises the twenty-three cases who made the lowest preparation grades.

From the general averages of Table V it is readily seen that the preparation grade for the selection marked (x) is 94.4 per cent., and the examination grade for the same selection is 96.8 per cent. which is an increase of 2.4 per cent. over the preparation grade. Since the examination grade is the larger, it is evident that this

TABLE V

(x)			(y)			(z)			(w)		
Case No.	Exam. grade	Prep. grade	Case No.	Exam. grade	Prep. grade	Case No.	Exam. grade	Prep. grade	Case No.	Exam. grade	Prep. grade
2	100	98	47	90	99	48	69	74	30	90	71
20	100	95	2	100	98	21	70	87	43	75	73
58	100	98	3	93	98	64	73	84	48	69	74
22	98	95	15	95	98	46	73	80	40	80	75
25	98	96	26	92	98	34	75	83	44	83	75
28	98	91	58	100	98	43	75	73	49	75	78
41	98	94	69	98	98	49	75	78	65	75	79
52	98	95	18	97	97	65	75	79	23	92	80
57	98	92	33	85	97	27	76	93	46	73	80
69	98	98	4	97	96	13	78	92	29	90	81
4	97	96	14	92	96	50	79	84	36	90	81
18	97	97	24	95	96	16	80	88	37	92	82
8	96	91	25	98	96	95	80	84	39	83	82
63	96	87	53	91	96	40	80	75	34	75	83
15	95	98	59	91	96	42	80	92	35	80	84
24	95	96	1	90	95	67	80	89	50	79	84
31	95	92	5	83	95	5	83	95	64	73	84
61	95	92	20	100	95	6	83	91	62	83	85
11	94	93	22	98	95	19	83	90	38	90	86
3	93	98	52	98	95	39	83	82	21	70	87
56	93	90	41	98	94	44	83	75	63	96	87
14	92	96	10	83	93	54	83	89	16	80	88
23	92	80	11	94	93	62	83	85	45	88	88
Gen. Av.%	96.8	94.4	Gen. Av.%	94.3	97.9	Gen. Av.%	78.2	84.4	Gen. Av.%	81.8	81.1

selection evidently received benefit from the recitation and teacher. Therefore, this increase is the measure of the amount of good the (x) selection derived from the class discussions and the individual help given by the teacher.

The preparation grade for the (y) selection is 97.9 per cent., which is an increase of 3.5 per cent. over the preparation grade of the (x) selection. This difference indicates that the (y) selection has ability to more nearly master a subject alone than the (x) selection. Judging from their preparation records the (y) selection in ability is ranked first and the (x) selection second.

Again from the general averages, Table V, the preparation grade for the (y) selection is 97.9 per cent., and the examination grade for the same selection is 94.3 per cent., which is a decrease of 3.6 per cent. from the preparation grade. It is clearly evident that the (y) selection did not receive any benefit from the recitation. This difference of 3.6 per cent. as in the case of (x) selection, is the measure of the amount of good the (y) selection, which represents the pupils of first rank ability, received from the class discussions and individual help given by the teacher. It is then sufficiently manifest that the brighter and most capable pupils are not assisted but rather retarded in their studies, by that part of the recitation designed for correction of errors and misconceptions.

From general averages of Table V it will be noticed that the examination grades for the (w) and (z) selections are lower than the preparation grades. Therefore, the same conclusions in regard to class corrections are drawn for these selections as were drawn for the (y) selection.

Let us now compare the examination grades of the (y) and (x) selections. For the former the grade is 94.3 per cent. and for the latter 96.8 per cent. which is an increase of 2.5 per cent. for the (x) selection over the (y) selection. This difference indicates that the (x) selection more nearly mastered the subject than the (y) selection. Let us not forget the (y) selection, according to the preparation grade, has more ability than the (x) selection, but on the other hand, judging according to the examination grade, which is the measure of the amount of the subject actually mastered, it is found that the (x) selection shows that it, in truth, more nearly mastered the subject than the (y) selection, which represents the more capable pupils. Therefore, we can safely conclude that these pupils with the most innate ability and from whom we should expect the best

and highest results, judged by the amount they really master, which is indicate by their examination grades, fail to attain first rank, but instead take second rank with the first rate ability, while the B pupils with second rate ability attain first rank in the actual amount mastered.

A satisfactory answer for this condition can be found by looking back and calling to mind that the A pupils were hampered in the following ways:

(1) They were not given a chance or an opportunity to do work adapted to their abilities.
(2) In the recitation they are idle or inactive about 62½ per cent. of the time.
(3) They were given assignments that were at least 27 per cent. less than they should have been, if they had been given work enough to have required 52 minutes daily to prepare it.

Thus, we find the A pupils with much spare time, which coupled with the fact that they are never required to use their full ability, soon leads them to the consciousness that not more than a half effort is required of them in order to keep up their work. Under these influences they are led by distracting conditions to procrastinate, so that ere long a link is dropped, and then another. Although they think they will make amends in due time, but in time of need the amends are never made, and as a final result they are forced to take second place, while the B pupils, who are at all times conscious that they have a task that requires constant conscientious normal action to almost their full ability keep alert for everything that is necessary for a complete mastery, and they, ere long take first rank with second rate ability. Another contributing factor in favor of the B group is, that they more nearly have work that calls forth maximum ability than the A group.

In so far as the C group is granted the privilege of setting the standards for the work; (1) it is evident that not only the B group is hampered, but also the A group is so hindered and retarded by the arrangement that they are reduced to a second rank instead of a first rank standing; (2) it has been proved that even the C group does not receive all the good that they were given a chance to accomplish under such an arrangement; (3) the B pupils profited most from such a classification, and from the fact that they maintained certain wholesome attitudes toward their work, we may conclude that the most efficient mental growth at all times is attended by conscious continuous maximum of efforts and an alert-

ness for the facts and principles of the subject matter, which are necessary for its mastery. When such is not the case, as is with the A and C pupils, the best results cannot be attained.

With these truths in mind, it becomes little less than criminal to put pupils with various abilities together in classes, where 70 per cent., the A and B groups, are positively retarded in their mental growth by being hampered by the standards of the 30 per cent., the C group, who are not in any certain degree helped by such an artificial classification.

Summary, Suggestions and Comments

(1.) The most rapid performers are the most accurate.
(2.) The macimum length of effort of the most accurate and most rapid pupils is greater than of the slower and less accurate.
(3.) The slower and less accurate pupils become more and more fixed in the poorer group.
(4.) The length of time of accurate performance can be increased by practice.
(5.) The poorer group is the only one that has an opportunity to work to their full ability.
(6.) The brighter pupils are retarded for the sake of the poorer pupils.
(7.) The best retainers are the most rapid workers.
(8.) The best retainers are those who most nearly work with a maximum of effort at a maximum rate.
(9.) The best retainers are not necessarily the most thorough pupils.
(10.) It often happens that the most capable pupils take second rank, while first rank is attained by those of lower ability.
(11.) In general it does not hold that a poor pupil will be greatly benefited by being placed in classes with brighter pupils.
(12.) The most efficient mental growth must be accompanied with a conscious continuous maximum of effort, and alertness for facts and principles necessary for a mastery of the subject.

The problem of so arranging the school schedule that each pupil may be able to work to his full ability is not new. Every school system in some form or other consciously or unconsciously makes a more or less satisfactory attempt to solve it. It would be useless to try to enumerate all the methods and devices proposed for its

solution; however, let it be sufficient to call to mind the importance of the problem by noticing some of the more common, which are more or less make-shifts and not solutions.

(1.) By allowing the bright and more capable pupils to carry extra work.
(2.) By excusing those above a certain standard from examinations.
(3.) By organizing classes for repeaters.
(4.) By giving supplementary work.
(5.) By making the course so that the brighter pupils can finish in a shorter time.
(6.) By giving individual help to the pupils.
(7.) By furnishing tutors for the poorer and less capable.
(8.) By organizing the work along certain lines according to certain methods. This device has so recently been in vogue that all readily recognize it.
(9.) By writing text books so as to give a minimum and a maximum course.
(10.) By organizing the work so that it attracts the pupils.
(11.) By organizing classes for retarded pupils.

From these illustrations it is plainly evident that this problem is generally recognized in all phases of school life. No one as yet has been able to propose a satisfactory solution; however, some plans may be better than others. Among the best might be mentioned a system, where the work is so organized that a pupil, if capable, can do the work in a two term course, or if slow be allowed three terms.

In some places the course is organized to develop leaders from the brighter class who set the standards high. In order to keep the balance between the brighter and poorer students, tutors are furnished to assist the teacher with his work. Since the course is set for the brighter pupils, the poorer pupils must take care of themselves or be dropped. By this system something like two years of work is gained by the time the High School Course is completed.

Some schools endeavor to give individual instructions to each pupil. By this plan each pupil has an opportunity to do his maximum work, which is very good. No doubt each device proposed has one or several good points, but the satisfactory solution is not obtained. There may not be any such solution. But be that as

it may, there undoubtedly should be something done to stop the wail that is going up from all quarters, "What shall be done with the bright pupil?"

In the face of the above proved facts it appears that some relief might be had if the school should seriously recognize the difference of pupils' abilities and rates of performance, and organize the course along such a line. Let the false standard, that all pupils have the same ability, be broken down, and for once truly and frankly recognize that they are wholly different, and thereby cannot uniformly perform the same task at the same rate. It appears that until such a scheme can be wrought out, the school will go on sacrificing the best and by far the greatest amount of talent for the 30 per cent., the poorer, which sacrifice does not necessarily bring any good to them. Each pupil should be situated so that he could and would put forth a conscious continuous maximum of effort and alertness, in order that the best mental growth be obtained.

WHOLE VERSUS PART METHODS IN LEARNING NONSENSICAL SYLLABLES*

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Whole method procedure demands the continuous repetition of an entire body of material until the desired stage of mastery is attained. Part procedure demands an initial mastery of definite sections of the material and the final connection of these different sections in proper serial order. It has seemed established that the whole method proves the more efficient in the field of learning verbatim. A recent paper† has shown, however, that certain modified forms of the part method prove far superior to the whole method when a motor problem is being learned. In so far as the maze problem may be considered typical of the motor field, one is led to face one of several propositions: (1) There is no correlation to be drawn between learning upon the motor and ideational levels. This proposition is substantiated by no experimental evidence. (2) The results obtained for motor learning are inapplicable to the ideational realm, since the motor problem studied allowed the subjects to distribute their learning over many days, whereas the accepted results for learning verbatim have in general been secured under massed conditions of learning effort. The validity of this proposition is sound until the relationship between distributed and massed conditions of learning is thoroughly established. (3) The field of learning verbatim is not sufficiently tested. This statement has validity only in so far as it suggests that certain modified forms of the part method have not been employed in this field and that final generalization as to the superiority of the whole method must be deferred until these modified part methods have had opportunity to show that they fail to duplicate the efficiency shown in motor learning. This paper directs attention, therefore, primarily to learning nonsensical syllables by numerous whole and part learning methods and secondarily to comparing the results with those for learning motor problems under like massed conditions.

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*Read at the annual meeting of the American Psychological Association, December 27–29, 1917.

†PECHSTEIN, L. A., *Alleged Elements of Waste in Learning a Motor Problem by the Part Method*, Jr. Ed. Psychol., 1917, 8, 303.

The experimentation employed two series of nonsensical syllables. The A–Series consisted of thirty-two syllables in consecutive arrangement. The B–Series consisted of the same syllables but arranged in sixteen pairs, as 1–2, 3–4, 5–6, etc. The series were mounted on a mechanically driven drum and were exposed singly or in pairs through an adjustable aperture. The A–Series required an exposure of two seconds per syllable, the B–Series four seconds for each pair. The A–Series was considered learned when the subject could successfully anticipate and write each syllable when shown the immediately preceding one. The B–Series was considered learned when the subject could write the second syllable of each pair when the first syllables were shown as stimuli. These stimulus words were arranged in different order from their position in the original paired learning series. Each subject was given a learning trial and a test for measuring the amount learned immediately after each such trial, two seconds being allowed to anticipate each subsequent syllable in Series A or to recall the paired associate in Series B. The amount learned was calculated for each trial and the difference between a perfect score and this amount learned per trial was called the learning error.* Students in introductory psychology were used for subjects, no student having had earlier experience with the learning material. Each student learned one series by an assigned method. Six students constituted a learning group for a single method and series and the results obtained were averaged.

A description of the methods employed reveals significant differences. Of the whole methods, the learner may be allowed full opportunity to retrace the material earlier traversed in the trial and hereby to work over certain difficult sections before reaching the end of the series. This method is apparently a natural one for some organisms and is designated the Whole Method—'Returns Allowed,' Type A. The learning series is kept upon the drum, whose rotation is controlled as desired by the learner. The method renders it possible to keep a record of the number of times the material is completely worked through and to test the amount learned after each such trial. Because of the unlimited possibilities of returning, a question immediately arises regarding the satisfactory criterion of learning. The student soon learned not to complete

*A syllable was considered learned when it was spelled correctly and recalled in ts proper place. No credit was given if the syllable was out of place. A single letter was credited if properly placed.

a learning trial until he felt reasonably sure of having mastered much of the material. Consequently, the number of trials for learning and the number of errors would seem so small as to argue that the method is quite efficient. On the contrary, the excessive amount of time consumed by each trial argues for the inefficiency of the method. The time measurement seems the only just one for comparative purposes. Type B differs from Type A in that the student is allowed to completely learn the material in private before being tested, with retracing as desired. Time is the only measurement of the learning. Contrasting with these whole methods which allow full opportunities for returning, the method entitled 'Returns Prevented' requires the subject to study each syllable a constant period of time and to pass directly to the next one of the series.

The part methods are four in number. The "pure part" method requires that the material be divided into four equal parts, each part learned as a unit, and then the connecting of the units in proper serial order. For the A–Series, this makes each unit to consist of eight syllables; for the B–Series, of four pairs of syllables. The "progressive part" method requires that the first two sections be learned as separate units and then connected as soon as the second is mastered; the third unit is then learned separately and immediately added to the earlier material; the fourth unit, learned and then added to the complex unity already established, completes the learning act. The "direct repetitive" method provides that the first section be learned as a unit and that the learner review this section at each trial as an introduction to the new second division. When the first two units are finally thus mastered, they constitute the introductory review as section III is being learned, and the three in turn for section IV. The "reversed repetitive" method permits as the initital learning the last unit of the series, whereupon the subject is introduced to the new next-to-the last section, reviewing the previously learned one as the final part of each learning trial. When these two units are mastered, the subject is introduced to the next earlier unit and reviews all the previously learned sections as the final part of each learning trial. These two methods are, therefore, review methods and differ only as regards whether the review introduces or follows the unlearned unit. The "progressive part" and the two "repetitive" methods agree with the "pure part" method in satisfying the requirement that the material be

learned in parts; they differ from the "pure part" method in that they significantly modify the time and manner of connecting the several separately learned parts.*

These methods lend themselves most admirably for employment in learning a maze earlier reported.† This maze is divided into four distinct parts or units, each possessing the same number and type of cul de sacs, the same linear distance in the true pathway, entrances and exits into a common place, etc. By the removal of sliding panels, the maze can be learned as a whole or separately learned parts easily connected. The number of trials, the errors (*i. e.*, entering the blind alleys), and the total learning time can easily be measured. Consequently, learning this maze is highly comparable to learning such material as the nonsensical series A, when the sections are equated for length, and where the material may be learned as a whole, in parts or in any desired combination of parts. It is slightly less comparable to the B–series, for this series requires the learner to state the proper associates in an order differing from that of the original learning and hence renders impossible the fixing of such definite unit habits as are allowed and required by both the A–Series and the maze.

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*The time and manner of the complex act of connection are exceedingly important. Positional relationships of space and time are established during the learning of each unit and these are markedly reconstructed during the acts of connection. For an analysis of these relationships and their significance in whole-part learning, see PECHSTEIN, L. A., *Whole vs. Part Method in Motor Learning. A Comparative Study*, Psychol. Rev. Mon. Supp., Vol. xxiii, No. 2, p. 42.

†Ibid. pp. 4–5; 70; Also, Jr. Ed. Psychol., 1917, 8, p. 304.

TABLE I

*Whole and Part Methods in Learning**

Method	Trials			Errors			Time		
	Maze	A–Series	B–Series	Maze	A–Series	B–Series	Maze	A–Series	B–Series
Whole									
Returns Allowed									
Type A	30	18	6	260	830	127	1250″	3461″	994″
Type B								4552	2040
Returns Prevented	25	14	12	204	573	220	1208	1772	736
Part									
Pure Part	10	13	11	107	409	214	538	1654	712
Progressive	14	9	11	96	148	126	536	1152	672
Direct Repetitive	24	12	15	120	237	155	716	1576	936
Reversed Repetitive	20	10	20	126	139	212	764	1297	1312

*Group averages to show the number of trials, errors and length of time required to learn certain problems by different "whole" and "part" methods. The first problem is the typical pencil maze. The A–Series is a list of thirty-two nonsensical syllables, the B–Series being the same syllables arranged in pairs. The criterion for having the maze learned is its perfect traversal; for the A–Series, successful anticipation of each successive syllable; for the B–Series, successful statement of the paired associate. The several "part" methods differ only as regards the manner of connecting the several parts. Of the "whole" methods Type A allows unrestricted trials upon the material and a measurement of the learning after each such trial; Type B allows the subject to completely learn the material in private before being tested, the sole learning measurement being in terms of time.

A comparative study of the data secured (See Table I) reveals three important conclusions. (1) So far as the whole and part methods are concerned, all the part methods prove superior to the whole methods, both for maze learning and for the highly comparable A–Series of nonsensical syllables, this superiority being demonstrated throughout by all the three criteria of learning, namely—trials, errors and time. Also, only the wasteful repetitive methods are inferior to the whole method when the B–Series is concerned, and this inferiority is only shown in the unavoidable requirements of trials and time, not in regard to errors. It suggests that less reviewing would have secured all the advantages of these repetitive methods and produced results uniformly superior to those of the whole methods. (2) One of the part methods, namely, the "progressive part," wherein each new section is learned as a unit and added at once to the earlier learned materials, is consistently most efficient throughout all the various learning tests. In maze learning, it is superior to its nearest competitor both in time and errors; in both the A–Series and B–Series, it is overwhelmingly superior in all three respects,—trials, errors and time. (3) Motor learning and learning verbatim obey, in the main, the same laws of learning, as witnessed by the facts that, in both cases, the part methods are more efficient than the whole; that the same part method is consistently the best in each field; that marked positive correlation invariably maintains between the results secured in the two fields by the entire list of methods, irrespective of whether the correlation relates to the trials, errors or learning time.

The conclusions suggest two points of explanatory value. It seems that any part method has certain inherent advantages, although these values may be lost sight of if the complex act of unit connection is not properly controlled. The advantages can be mentioned only in passing. The first of these is the matter of transfer. It is possible to show that the learners master successive units with increasing ease. The second advantage refers to the relation between learning effort and the length of the material. Neither for motor learning nor for this verbal material does the learning effort vary directly with the length of material. Diminishing returns are invariably secured as the material is lengthened. Any part method secures complete utilization of the items of transfer and avoids the diminishing returns due to the excessive length of the motor problem. Any whole method fails in both respects.

The second point of explanatory value refers to two principles operative in all learning. The first of these is that of *elimination*. It connotes the detection of the critical points in the problem, the careful study of all the details, the formation of proper associations, the rejection of others, etc. Consciousness is here at white-heat. The longer and more difficult the problem, the greater the task upon the learner to see the many details of the problem and to learn to eliminate the possible faulty reactions. Confusion, hesitation, emotional conditions all operate to delay the learning. If the problem is short, as is always the case with part methods, the principle of elimination can operate more effectively. The second principle is that of *mechanization*. The final stage of learning is no longer explorative and eliminative but rather, mechanizing and rendering habitual the entire activity. Whole method learning presents so many critical details that the principle of mechanization is not only delayed in being given an opportunity to operate but is repeatedly nullified by the reinjection of the highly conscious eliminative principle. Part methods utilize these principles to greater value. The explorative or eliminative principle is operative when the details of the short and easy parts are being mastered. The mechanizing principle then becomes operative, both logically and chronologically. It secures the mechanization of each unit and then the connection of the several units, being concerned only with rapidly welding the several unit habits. Hence any part method secures complete utilization of the principles of elimination and mechanization. Any whole method fails in both respects.

In conclusion, it may be said that the demonstrated advantages of these part methods when operating in the fields of motor learning and in learning nonsensical series verbatim, lead the writer to question the superiority of the whole method in the remaining field of meaningful material until the results of certain modified forms of part learning have been obtained herein and found inferior. This work is well under way.

THE RANGE OF INFORMATION TEST IN BIOLOGY II. ZOOLOGY*

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I. INTRODUCTORY

One object in conducting investigations on range of information[2] in common-school branches has been to answer in part at least a question of economy in school administration—how much knowledge of the branches represented in both secondary and grade schools may we expect pupils to carry from the grade into the next higher division of the school system? With the formal barrier between the grades and the older type of secondary instruction broken down by the nascent junior high school and its characteristic general science, this question is important in connection with the content of biological science taught in secondary schools, since it is preceded in the grades by physiology and nature study. The matter of physiology has been taken up in the initial paper of this series,[3] (2) and it is proposed to treat in a similar manner the two main components of "nature study," elementary zoology and botany. The writer aimed also, in line with views of his urged in a previous note[4] to indicate how general science might be articulated with the semi-scientific branches of the grades so as to form in the school system a logically complete unit.

The problem of high-school zoology is mainly one of content. More disagreement exists here than in any other science taught in the high school. Two questions are at issue: First, To what extent shall "natural history" form a part of the course in zoology? If it can be shown that pupils entering from the grades are comparatively ignorant of those main forms of animal life which enter into direct economic relation with man, then high-school zoology must make provision for this neglect in nature study.

If, on the other hand, it may be shown that "natural history" is well taken care of by the grades, aided by the taste which preadolescent pupils have for reading of this type, the time customarily given it in many high-school courses of zoology may be devoted to a more intensive study of this science, such as usually characterizes

*The writer is indebted to the authorities of the St. Louis Schools, and Prof. L. M. Dougan, Principal Shaw School, St. Louis, for aid in the furtherance of this investigation.

high school physics and chemistry. Lloyd and Bigelow[5] remark that "secondary pupils do not undertake certain studies of living animals with the enthusiasm and earnestness which characterize nature studies in the grade schools; to the average secondary pupil studies of living animals are not part of serious science work," and further "it may well be doubted whether a course devoted exclusively to natural history is altogether best for secondary work." Very few textbooks are now in use which attempt high-school zoology on a natural history basis, but most have a liberal and perhaps unnecessary sprinkling of it.

The second question is whether the study of physiology and of physiological principles shall form part of the course in high-school zoology, since an essential feature of biological thought is that the activities of the human body be interpreted from the comparative standpoint. One short-lived effort to solve the problem of the content of high-school physiology resulted in a combination of zoology and physiology known as "comparative physiology." Some light may be thrown on this aspect by the preceding paper of this series.

II. Method

The 100 test-words were selected in the following manner. A list was first prepared of all those words pertaining more directly to botany and zoology discovered in the spellers and readers previously used by the pupils in their grade-school work. A similar list was made from Boy Scout and Camp Fire Girls publications. From these lists, and from a list prepared by Professor Dougan, who recently had charge of the revision of the nature study courses in the St. Louis schools, one hundred of the more frequently occuring words were checked. In selecting the words of his list the writer like Professor Dougan chose: (1) words in fairly common use, a knowledge of which would indicate the range of information in the natural history of animals of outstanding interest to man; (2) words, a knowledge of which would indicate some familiarity with physiological processes and which would be representative of lower animal groups as well as of man.

Since the method of giving the test has been discussed previously,[2] there is given here only the list of words used. I may explain only that in presenting the test, the pupils were told how the terms were selected and it was understood that they pertained directly or indirectly to animals.

III. Results

The results are found in the following tables. By "first-term students" is meant those taking up the study of botany at the time. "Second-term students" have finished botany and are beginning physiology. It may be well to remark that as a check on the original marking of the pupils ("first series"), the 100 words were defined by the examiner from the glossaries of text-books containing the words, and each pupil revised his own paper by placing a "second series" of marks after each word indicating the manner in which he should have marked it. A comparison of the D's, E's, F's and N's of the first and second series, besides showing fairly accurately the extent and nature of the error due to ignorance or misunderstanding of the real meanings, gives a rough preliminary measure of the extent to which these 100 terms are understood by first-year high-school pupils.

Test Words

abdomen	domestication	moth	rodent
absorption	down	nape	ruminate
antennae	drone	nestling	sail
auricle	drumming	nocturnal	scale
barb	excretion	non-retractile	shaft
beak	fin	nutrition	silkworm
beetle	gill	nymph	skeleton
bivalve	gizzard	ovipositor	soar
biped	grub	oxidation	spiracles
burrow	gullet	pancreas	stomach
butterfly	herbivorous	parasite	summer-resident
call	hibernation	pearl	tadpole
canine	incisor	perching	talon
carnivorous	insectivorous	permanent-resident	thorax
caterpillar	intestine	pigment	transient-resident
cerebrum	gland	prehensile	vein
chrysalis	kidney	primaries	venom
circulation	larvae	proteid	ventricle
clams	liver	pupa	vermin
cloven-footed	locomotion	quadruped	wading
cocoon	maggot	queen	wax
coral	mammal	quill	web-footed
coverts	migration	respiration	winter-resident
cross-pollination	mimicry	reproduction	worker
diurnal	molars	retractile	yolk

TABLE I

Dependence of Range of Information on Academic Status

(1st series)

Academic Status	No.	D.	E.	F.	N.
1st-term pupils	26	14	27	15	43
2nd-term pupils	87	19	30	22	29

(2nd series)

Academic Status	No.	D.	E.	F.	N.
1st-term pupils	26	23	29	12	35
2nd-term pupils	87	25	30	19	26

While it is evident from Table I that with maturity there is some increase in the number of terms that can be defined (D), explained (E), and are familiar (F), with a corresponding decrease in the number of new terms (N), yet as was shown also in the table on academic status in the preceding paper in the series, the greatest change is in the number of F's. The difference in D's and E's is so slight in both series and decreases to such an extent in the second that so far as a knowledge of "Natural History" is concerned, the writer is inclined to attribute the increase to the more highly organized motor processes of the second-term pupils, as shown by their ability to carry out more readily the writer's instructions while giving the test. This is somewhat substantiated by the fact that only 3 of the test words used occur in the preceding course of botany. The checking up process increases the number of D's and E's, and decreases the number of F's and N's in this table as well as the others. Some confirmation of Lloyd and Bigelow's statement that the pupil's interest in natural history declines at this age is shown by the want of a more decided increase in the number of D's and E's, also by the average error of marking, 6 per cent. in 1st-term pupils, 8 per cent. in second-term pupils. If their interest was a more active one, a greater percentage of D's and E's could be expected in second-term pupils, and they might be expected to show a less percentage of error. At best it seems that discriminatory power in the subject of Natural History has not advanced.

These results reclassified by sex do not show significant differences between the sexes, except in the percentages of error after second checking. These indicated that the boys were more accurate in judging the exactness of their comprehension of the 100 terms than were the girls.

A list of typical errors of definition follows, in which the words that apparently are the source of confusion are indicated in parentheses. Comparison with the list published in the previous article

of this series will show how deep-seated the errors in the meaning of terms may be, and, as previously suggested, will furnish opportunities for objective attacks by teachers in solving the first problem indicated in this paper. It is felt that they form a basis, conscious effort with which on the part of the teacher will serve to put the subject matter of nature study into such form as will readily carry over into zoology.

Antennae—sting of a bee: feelers on a butterfly: part with which an insect sees and feels, and like a long bar.

Abdomen—stomach: lower part of bowels.

Absorption—taking in of liquids in form of vapor: taking in of oxygen.

Auricle—vein through which blood passes from the heart.

Butterfly—a fly with large wings and body: a little worm that has wings and flies: a moth like a bug brightly colored.

Beetle—a small bug: quadruped creature: animal derived from fly family.

Biped—an object built on a plan of 2 (Bilateral Symmetry).

Beak—nose piece of an insect (proboscis): mouth of a duck (bill).

Burrow—a species of mule used mostly in the mountains (burro).

Bivalve—double value (bi-valve).

Caterpillar—a worm which crawls on flowers and on ground: is a silk worm: inside of a butterfly.

Cocoon—a little winter home for a silk worm.

Carnivorous—that which eats human substance.

Clovenfooted—the skin between the toes: to have feet like a horse.

Coral—stockade of animals (corral): skeleton of a fish: parasite animal of the sea: a gathering of dead animal matter from the ocean.

Canine—pertains to dogs, especially teeth: a poison, some in coffee (caffein).

Drone—a bee that is lazy and lays eggs: a female which does not work.

Drumming—a man who goes around selling goods.

Down—below.

Fin—a sharp pointed projection on the back of the fish used for protection.

Gill—¼ pint.

Grub—rough way of saying "food."

Incisor—to insert or drill.

Intestine—soft part of stomach: eggs of moth.

Kidney—bone on inside of stomach.

Larva—hot substance given off in an eruption (lava).

Nymph—a water object consisting of a human body and fish.

Proteid—sugar or starch food.

Scale—thorny substance on the back of a fish.

Yolk—white of an egg.

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[2]WHIPPLE, G. M., *A Range of Information Test*, Psych. Review, 16: 1909, 347–51; also *Manual of Mental and Physical Tests*, Test 51.

[3]GRIER, N. M., *The Range of Information Test in Biology; I Physiology*, Vol. 9: 1918, p. 210, *This Journal.*

[4]GRIER, N. M., *Huxley and General Science*, School and Society, Vol. 6, No. 136.

[5]LLOYD AND BIGELOW, *The Teaching of Biology.*

THE INFLUENCE OF PRACTICE ON THE CORRELATION OF ABILITIES

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Correlations which have been computed between mental tests have been, for the most part, comparisons of initial trials or of records made after a few preliminary trials. Only in one case was an experiment performed in which it was possible to correlate the abilities of individuals who had in all probability reached their practice limit in the tests used. Professor Hollingworth reports an investigation in which he compares records made after one, five, twenty-five, eighty, and two hundred and five repetitions of each of seven tests.* He finds a high correlation between some of these tests (*i.e.*, the familiar adding, tapping, opposites, color-naming tests) after the two hundred and fifth trial. He finds a progressive increase in the average of correlations of all tests from the first to the two hundred and fifth trial. This increase of co-efficients with practice and final high correlation leads the experimentor to favor some form of the doctrine of "general ability," to suppose that there may be, when a practice level is reached, a positive correlation of desirable traits.

The experiment which follows was prompted by a desire to test this hypothesis further. Five tests were used in the investigation. These were:

Color-naming: Two Woodworth-Wells blanks pasted together. Record, time required to name correctly a set of two hundred colors. Test repeated twenty-five times.

Tapping: Record, number of taps executed in two minutes with the hand stylus, right hand. Test repeated twenty-five times.

Adding: Kraepelin blank used. Record, time required to add one hundred examples of two numbers each. Test repeated thirty times.

Multiplying: Record, time required to solve mentally a set of five multiplication examples. The examples required the multiplying of one two-place by another two-place number. No number below four was used—no example was repeated. Test repeated twenty-two times.

*H. L. HOLLINGWORTH, *Vocational Psychology*, Ch. xi; also *Correlation of Abilities as Affected by Practice*, J. of Ed. Psych., Sept. 1913, pp. 405–414.

Word-building: Record, number of shorter words built from a given word (as weather, psychiatry, etc.) in a specified time. Words varied in difficulty and the amount of time was changed as the experiment proceeded. The test had twenty-two repetitions.

It is important to note the difference between these last three tests and those used in Professor Hollingworth's investigation. A repetition of the tests used in the former experiment meant a going-over of identical material. Definite bonds were formed and perfected. Responses in the opposites and adding tests became like responses in the color-naming test. The adding, multiplying, and word-building tests of the present investigation were chosen with a view to eliminating, as far as possible, the probability of a change in the nature of the tests. Responses cannot be stereotyped for they are changed at each repetition. In the adding experiment, there were six different sets of one hundred numbers each used. There was no possibility, then, of learning the order of appearance of the answers. In the multiplication test we have each time a different problem, and in the word-building a different word. Practice in these cases means not so much the strengthening of a few particular bonds, as acquiring experience in the exercise of some "mental function."

The subjects in the experiment were fifteen college students. Each subject spent two separate half-hours a week in practice. The entire experiment extended over a period of from seven to eight weeks. All records were taken, with a stop watch, by one person.

In order to find the relation of an individual's proficiency in one sort of test to her proficiency in the others at different points of the curve of practice, the practice period was divided into eight parts, at each of which parts the records were correlated. These divisions were:

1st Division. The initial trial.

2nd Division. The second, third, and fourth trial of color-naming, tapping, multiplying, word-building. The second, third, fourth and fifth trial of adding.*

3rd Division. Fifth, sixth, seventh of four tests. Sixth, seventh, eighth, ninth of adding.

4th Division. Eighth, ninth, tenth of four tests. Tenth, eleventh, twelfth, thirteenth of adding.

5th Division. Eleventh, twelfth, thirteenth of four tests. Fourteenth, fifteenth, sixteenth, seventeenth of adding.

*The adding test was the shortest and was given the largest number of trials. Therefore four adding trials were united to make one division, while only three of each of the other tests were used.

6th Division. Fourteenth, fifteenth, sixteenth of four tests. Eighteenth, nineteenth, twentieth, twenty-first of adding.

7th Division. Seventeenth, eighteenth, nineteenth of four tests. Twenty-second, twenty-third, twenty-fourth, twenty-fifth of adding.

8th Division. Twentieth, twenty-first, twenty-second of four tests. Twenty-sixth, twenty-seventh, twenty-eighth, twenty-ninth of adding.

At each of these points the average record made by each individual in each test was correlated with her average record in other tests. The correlation formula

$$R = 1 - \frac{6\Sigma D^2}{n(n^2-1)}$$ was used.

The details of the correlation are omitted in this article. Table I gives the average correlation of each test with all other tests, at eight points in the practice period. The coefficients in the original table for each test at each point, have been averaged to make Table I.

TABLE I

Average Correlation of Each Test With All Other Tests, including Multiplying. Average Used as Measure

Divisions	1	2	3	4	5	6	7	8
Color-naming.....	.14	.15	.26	.28	.33	.32	.24	.31
Tapping.....	.22	.22	.28	.19	.29	.38	.12	.16
Adding.....	.23	.19	.43	.36	.45	.48	.42	.35
Multiplying.....	.17	.06	.19	.18	.20	.25	.12	—.10
Word-building.....	.24	.52	.27	.34	.42	.45	.39	.26
Average.....	.20	.23	.29	.27	.34	.38	.26	.19
Average of each two	.215		.28		.36		.225	

Here a gradual increase in coefficients is noticeable which reaches its maximum at the sixth division, where the average correlation of all tests with all other tests is +.38. After this point there is a decrease which is slight in all tests, but multiplying.

Further inspection of the table shows that the multiplying test is characterized by low and irregular correlation with all other tests but adding. The multiplying test, the most complex of all, was the one in which there was the least approximation to a practice limit. The fact that in this test there was not enough practice to eliminate variability or to equalize the effects of previous practice might account for this lack of definite correlation. It is noticeable that the correlation did increase up to the sixth division, where it became +.25, but after that, through accidental variation or other causes, it became low again.

TABLE II

Average Correlation of Each Test with all other Tests, excluding Multiplying. Average Used as Measure

Divisions	1	2	3	4	5	6	7	8
Color-naming.....	.16	.32	.36	.41	.46	.45	.34	.44
Tapping.....	.28	.25	.28	.22	.39	.49	.26	.30
Adding.....	.20	.17	.40	.30	.36	.50	.45	.45
Word-building.....	.26	.66	.33	.41	.50	.42	.38	.38
Average.....	.23	.35	.34	.34	.43	.49	.38	.39
Average of two.....		.29		.34		.46		.385

TABLE III

Average Correlation of Each Test with all other Tests, excluding Multiplying. Median used as Measure

Divisions	1	2	3	4	5	6	7	8
Color-naming.....	.16	.32	.38	.42	.46	.47	.35	.31
Tapping.....	.28	+.06	.26	.19	.43	.43	.18	.17
Adding.....	.20	−.04	.45	.24	.49	.49	.33	.33
Word-building.....	.29	.27	.32	.41	.47	.45	.32	.26
Average.....	.23	.15	.35	.32	.36	.36	.30	.27
Average of two.....		.19		.335		.36		.295

In order to eliminate the tendency of multiplying to lower all coefficients, other tables were prepared from which correlations with multiplying were omitted. Table II shows the average correlation of each test with all other tests excluding multiplying. There the coefficients are higher and their upward trend even more obvious. They increase steadily up to the sixth division where they fall off a bit, never becoming, however, as low as they were in the first, second, third and fourth divisions. Table III shows a like result. The difference between this table and the two preceding ones is that here the median record of each division was used as the unit of measurement, whereas in Table I and II the records in each division were averaged.

TABLE IV

Average Correlation of each Test with all other Tests, excluding Multiplication. Best Record Used as Measure

Divisions	1	2	3	4	5	6	7	8
Color-naming.....	.16	.29	.55	.45	.51	.54	.50	.44
Tapping.....	.28	.28	.25	.19	.42	.51	.26	.34
Adding.....	.20	.22	.46	.24	.47	.57	.45	.41
Word-building.....	.29	.33	.40	.32	.54	.61	.34	.53
Average.....	.23	.28	.42	.30	.49	.56	.39	.43
Average of two.....		.26		.385		52.5		.41

In Table IV only the individuals' best trials in each division were considered. Accidental causes, of poor records were eliminated here. One would expect, if correlations do increase with approach to a practice level, that where highest ability only was measured, coefficients would be higher than they are in the tables computed from average and median measurements. This is the case. All average coefficients are higher. The best coefficient ever reached (56 per cent. in the sixth division) is found here.

TABLE V

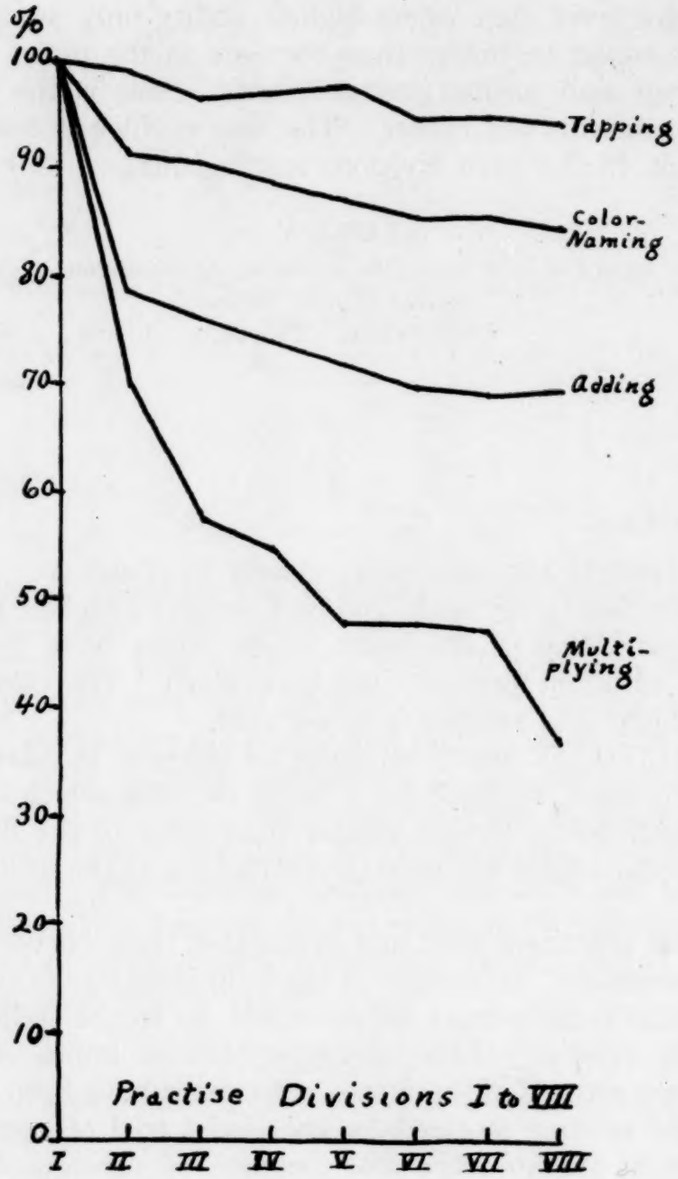
Correlation of each Test with every other excluding Multiplication at Highest Point Reached by Each Subject

	Color-naming	Tapping	Adding	Word-building
Color-naming	...	.49	.53	.36
Tapping	.49	...	.21	.37
Adding	.53	.21	...	.52
Word-building	.36	.37	.52	...
Average	.46	.36	.42	.42
Average of Average		.42		

This is brought out even more clearly by Table V. The eight divisions are done away with, and each subject's highest point only is considered. This is the point which might have become the average if sufficient practice had been given. The correlation is relatively high—the average is 42 per cent.

Tables II, III, IV and V all show an increase in correlation up to the sixth point, followed by a slight decrease which makes the last two coefficients, though greater than those of the first to the fourth periods, a little less than the coefficients of the fifth and sixth divisions.

Individual practice curves, and averages of these curves show this same phenomenon. Inspection of the individual curves (not shown in the article) reveals great improvement up to the sixth division, followed by relatively little or entire lack of improvement. In the figure the records of the fifteen individuals have been averaged. The amount of time required for the initial trial of each test has been taken as the standard and averages of subsequent practice divisions are represented in terms of per cent. of this record. No word-building curve is shown, for the varying difficulty of the words and the different amounts of time allowed make such a curve worthless. The curves of the other four tests show gradual, steady decrease until the sixth division, after which there is an average


%
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Tapping
Color-Naming
Adding
Multi-plying
Practise Divisions I to VIII
I
II
III
IV
V
VI
VII
VIII

improvement of only seven tenths of one per cent., in color-naming, five-tenths of one per cent., in adding, and three-tenths of one per cent. in tapping. Multiplying shows a greater improvement (10 per cent.) but even this is small when we compare it with the 52 per cent. improvement gained before this. It seems as though at the sixth division some sort of a practice level is normally reached. This point corresponds exactly with the place where increase of correlation coefficients has ceased.

This correspondence might imply a casual relation of some sort. The lack of improvement in ability might be suggested as the cause of lack of improvement in inter-correlations. *Where practice improves performance, correlations increase.* Where there is a fall in effort, ability, or what-not, or where accidental causes lower proficiency, the coefficients stand still or show a slight decrease.

The results of this experiment seem to show a positive correlation increasing with practice between the abilities measured by these tests. This is brought out by a correlation of median points and average points of all tests but multiplying, confirmed by a comparison of best records, that is, of records representing more closely the approach to the practice limit. The fact that multiplying, a more complex, less easily mastered test, correlates poorly need not weigh against our hypothesis, but may even be urged in support of the assumption that higher proficiency is needed for greater positive correlation. A comparison of practice curves with correlation coefficients brings further evidence for the theory that improvement in ability is a factor in the increase of correlations.

The great similarity of the subjects used and the dissimilarity of the tests makes these results fairly convincing. But the small number of subjects available gives opportunity for many accidental errors, which further experimentation, now being carried on along this same line, may eliminate. The point here considered relates to one only of a number of problems which have practical and theoretical importance and which justify a detailed inquiry into the psychology of practice limits.

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EDITORIAL

Personnel

Never before in war has such explicit and varied use been made of psychology. From the mental tests given to all enlisted men to the special and highly involved studies in gun pointing, range finding, and aviation, psychologists are being called upon to assist the government to utilize to the utmost the brain power of the country. The slogan in every department is "the right man for the right place." An important factor in the realization of this ideal has been the work of the Committee on Classification of Personnel in the Army under the direction of Dr. Walter Dill Scott. To further the work of this committee a new periodical has recently been established by the Adjutant General entitled *Personnel*. The object of this periodical is to bring into closer touch the various agencies and officers that have to do with the selection of men for special tasks, and to enable the Adjutant General and other government officials to reach those with whom they wish to communicate more quickly and effectively.

The first number of the new journal contains the address of the Secretary of War, Newton D. Baker, before the eighth school for personnel adjutants at Camp Meigs, Washington. In the course of his address Secretary Baker gave a clear indication of the reaction which the mere term "psychology" calls forth in the average business or professional man.

"If one were to select, for instance, a general to command an expedition, he would be quite likely to select a man whom he liked as a man, and not with any relation whatever to his capacity to command the expedition. And this is true, generally, so that some system of talents which is not affected by immaterial principles or virtues, no matter how splendid, something more scientific than the haphazard choice of man, something more systematic than preference or first impression, is necessary to be devised. When Dr. Scott presented to the War Department the question of calling in psychology in this work we all realized that that science had a particularly unfortunate name; it sounds very highfaluting and cloud-stepping as it were. It is the skyscraper, so far as its name is concerned, of modern science, and there is a certain revulsion in the ordinary man's mind when you speak to him about a thing that sounds as pretentious as that. I commend to my good friend Dr. Scott that he try to see whether they can't change that term to the study of human action or something with a popular appeal. I am sure the impediment would be so much less if that could be done."

Now why should the mere term psychology be such an impediment? Why should it produce such a revulsion in the ordinary man's mind? In itself it is no more formidable than aerodynamics or ballistics. It must be on account of the associations that surround the word in the lay mind. Is it on account of its traditional association with metaphysical philosophy that psychology is regarded with suspicion, or is it because through newspaper articles, novels and other sources the term has been popularly connected with the study of spooks? At any rate the passing remark of the Secretary is significant of the need for popular enlightenment as to the scientific use of the term.

But the Secretary soon found that psychology, as represented by the Committee on Personnel, had certain very definite and specific things to offer, and he came to the conclusion that these things might be of distinct service in winning the war.

"The problem is to weld those millions not merely into an army which will fight —any American army will fight, we have discovered that; not merely into an army which is willing to die, if necessary, in order to maintain its position and uphold its traditions—we have discovered now that this is true of Americans everywhere; but an army which will fight with the least wastage, the most effective execution, the most intelligent co-operation, the most complete because the most understanding subordination, and that sort of an army comes only when men are doing the things for which they are by nature and training best adapted. Now that is a very high task, it is a task of contributing the finishing touches of efficiency to this great American army. I have myself been tremendously stimulated, not only by the care and wisdom employed in assigning each enlisted man but also by the result which Dr. Scott and his associates have obtained in the officer selecting tests which they have devised. The Rating Scale has been enthusiastically received by the Army, but I am told officers have occasionally objected to answering some of the Binet test questions the doctor has put to them; I have been rather afraid to take a Binet test myself, but when you finally come down to it, the Rating Scale and tests for mental alertness are the application of a perfectly rational method to the great problem of putting a man in the position where he can be of the most service to the country and to the common cause."

Thus, in spite of his aversion to the term, the Secretary pays high tribute to the service which psychology is rendering in perfecting the greatest fighting machine which this country ever contemplated.

J. C. B.

NOTES AND NEWS

The similarity between the Otis Absolute Point Scale for the Group Measurement of Intelligence, published in the May and June issues of this JOURNAL, and the military group intelligence scale used in the examination of recruits has been to some a source of wonder. It is fitting, therefore, that a statement be made regarding the priority relationships of the two scales. The Otis Scale was originally drafted in 1916, and, according to Professor Lewis M. Terman, a member of the committee, Mr. Otis generously placed his material at the disposal of the Committee on Psychological Examination of Recruits, which drew up the military group intelligence scale. The ingenious arrangement of the Otis tests for group examining served largely as the basis for the intelligence scale adopted by the committee for army use.

The work of educational reconstruction for wounded soldiers is making good progress at the Walter Reed General Hospital, near Washington. In July there were 488 soldiers taking one or more courses in the curative workshops and bedside occupational work at the hospital. Over thirty courses are offered, ranging from shoe repairing to commerical law, and five new buildings have recently been opened. The methods and materials of each course are adapted to the patient's particular needs or handicaps. The work occupies the time of fifty instructors, and is in charge of Major B. T. Baldwin, educational director and chief psychologist.

The Wisconsin Anti-Tuberculosis Association announces at the University of Wisconsin a course for health instructors, designed to train in a ten months' period a limited number of women in the fundamental knowledge of health conservation and disease prevention. The teacher with her professional training and her experience in dealing with children seems especially qualified to become this new type of worker—the health teacher. There is need for the health teacher in schools, in city health departments, in factory welfare departments, in health stations and clinics, and in many other of the reconstruction activities which America must undertake on an increasingly large scale as the war continues. The work is under the direction of Dr. E. V. Brumbaugh, and includes courses in fundamental principles of health administration, social service, rural health inspection, first aid, health games and corrective exercises, and health propaganda.

In accordance with a proclamation of President Wilson a campaign for infant conservation is being conducted by the health committee of the mayor's committee on national defense of New York City. The campaign is in charge of Dr. Josephine Baker,

director of the bureau of child hygiene in the health department, and almost fifteen hundred physicians, nurses, welfare and social workers have volunteered their assistance. It is estimated that there are over 600,000 children to be examined.

Dr. Frank V. Thompson, assistant superintendent of schools, has been elected superintendent of schools in Boston. Dr. Thompson was formerly principal of the Boston High School of Commerce, and has been prominently identified with the furtherance of vocational education in the United States. It is a noteworthy indication of the trend of thought in education that the new superintendents of both New York and Boston are men who are conspicuous for their interest in vocational education. It is to be hoped that this points to the reorganization of our school work on the basis of greater efficiency.

Dr. Walter S. Monroe, director of the bureau of educational measurements and standards at the Kansas State Normal School, Emporia, has accepted the position of director of the bureau of cooperative research at the University of Indiana.

Dr. Arthur Holmes, dean of the general faculty of the Pennsylvania State College, and author of *The Conservation of the Child*, *Backward Children*, and other works, has been elected president of Drake University, Des Moines, Iowa.

In their service bulletin for September *The World Book*, published by Hanson-Roach-Fowler Company of Chicago, present five interesting prize questions for the month, a reference outline of how our country's laws are made, the story of the month, and seventy "look-it-up" questions for the World Book Club. Teachers will find these bulletins very suggestive.

An important book by Professor James Burt Miner, of the Carnegie Institute of Technology, entitled *Deficiency and Delinquency; An Interpretation of Mental Testing*, is announced for publication in September by Warwick and York, Baltimore. The book presents a critical analysis of the numerous studies of defective delinquents, and contains much new material resulting from original investigations. It is one of the most thorough and fundamental discussions of the important question of mental and moral borderlines that has yet been produced.

Another book announced by Warwick and York is *Graphology and the Psychology of Handwriting*, by Professor June E. Downey, of the University of Wyoming. Psychologists are familiar with Professor Downey's investigations of handwriting, and will welcome this systematic consideration of the entire subject.

A significant book on *The Psychology of Childhood,*" by Naomi Norsworthy and Mary Theodora Whitley, of Teachers College, Columbia University, has just been issued by Macmillan, New York. An original feature of the book is the attempt to present a cross section of child life at the ages of five and eleven.

One of the most widely discussed war books is *Under Fire,* by the French artist and literary genius Henri Barbusse (E. P. Dutton, New York). Hotly attacked as too realistic and gruesome by some, it is vigorously defended and highly praised by the great French dramatist Edmond Rostand, who calls it a great poem, tumultuously and admirably arranged.

In *The Present Conflict of Ideals* Professor Ralph Barton Perry, of Harvard University, makes a study of the philosophical background of the world war. The author endeavors to relate the conflicting national ideals of the war with the philosophical tendencies of naturalism, idealism, pragmatism, and realism. The book is promised by Longmans, Green and Company for the last of September.

Psychic Tendencies of Today by Alfred Martin is one of the new fall books offered by Appleton, New York. Spiritualism, psychic research, theosophy, Christian Science, and New Thought, are discussed, and Sir Oliver Lodge's book *Raymond* is analyzed. The author believes that modern materialism, instead of denying immortality, shows the scientific necessity for belief in it.

The rapidly increasing share which women are called upon to take in the political life of the country makes *The Woman Citizen,* another of Appleton's September publications, very timely. The author is Professor Horace A. Hollister, state high school visitor at the University of Illinois, and the book is a survey of woman's status and achievement in the past and the present, and a discussion of the needed readjustments of woman's place in society.

PUBLICATIONS RECEIVED

LEONARD P. AYRES. *A Measuring Scale for Handwriting.* New York: Russell Sage Foundation, 1917. Five cents.

This scale is a revision of the author's 1912 "Three Slant Edition," and since all the samples are from the first lines of Lincoln's Gettysburg Address, it is named "The Gettysburg Edition." Directions are given for securing samples, grading them, and comparing with standard distributions of both quality and speed.

FRANK W. BALLOU. *Arithmetic. The Value to the Teacher, to the Principal, and to the Superintendent of Individual and Class Records from Standard Tests.* Boston Public Schools, Bulletin No. 13, of the Department of Educational Investigation and Measurement, 1917. Pp. 83. Seven cents.

An important practical contribution to the use of educational measurements in the class-room and in school administration. Suggestions are given for the interpretation of representative graphs, the utilization of records by the teacher, the eradication of deficiencies, the treatment of cases of marked accuracy and instances of exceptionally high and low ability.

DR. H. BERNHEIM. *Automatisme et Suggestion.* Paris: Libraire Felix Alcan, 1917. Pp. xv, 168. Fr. 2. 75.

Perhaps no one has done more to reduce the phenomena of hypnotism to a reasonable basis than Bernheim, of Nancy. The present book represents a quarter century of study and discussion on the subject of suggestion, and gives the ripely matured views of the author. Among the questions considered are the nature of reflex automatisms, automatism in mental life, hypnotism and artificial somnambulism, freedom and moral responsibility, psychoneuroses and psychotherapy. The author's views are entirely in accord with the behavioristic conception of mental life.

CHARLES SCOTT BERRY. *A Study of Retardation, Acceleration, Elimination, and Repetition in the Public Elementary Schools of Two Hundred Twenty-five Towns and Cities of Michigan.* (Reprinted in part from the Seventy-ninth Annual Report of the Superintendent of Public Instruction of the State of Michigan for the Year 1915–1916. Pp. 47.)

An elaborate statistical study. In no case do the accelerated pupils balance the retarded pupils.

HENRY BROWNE. *Essays on the Reform and Revival of Classical Studies.* New York: Longmans, Green and Company, (No date). Pp. xvi, 281. $2.60.

This eminent Jesuit classicist, writing from the point of view of the present educational crisis in England, realizes the change which the war is forcing upon educational thought and practice, and meets the issue very frankly. He is, however, an ardent advocate of reform in classical teaching, and believes that the stirring of educational ideas will serve to eliminate many of the present drawbacks to this work, and will revivify the classical spirit. He is espcially keen on the utilization of archeology, numismatics, and other phases of modern research in awakening in the minds of pupils an appreciation of the richness of Greek and Roman civilization.

H. ADDINGTON BRUCE. *Handicaps of Childhood.* New York: Dodd, Mead and Company, 1917. Pp. ix, 310. $1.50.

The author argues "that in view of the discoveries of modern psychology with regard to individual development the mental and moral training of children by their parents ought to be begun earlier, and be carried on more intensively, than is the rule at present." Hence the book sums up in easy, narrative form those suggestions from modern psychology and education that will be helpful to this end. Some of the handicaps considered are mental backwardness, being the only child, a sulking disposition, jealousy, selfishness, bashfulness, indecision, stammering, and a too vivid imagination.

Bureau of Educational Experiments. Playthings. Study of Animal Families in Schools. Experimental Schools. A Bibliography of Psychological Tests. New York: Bureau of Educational Experiments, 1917. Bulletins 1–5, ten cents each. Bulletin No. 6 (Bibliographv) twenty-five cents.

These booklets contain excellent suggestions about playthings and animals in the schoolroom, describe several interesting private schools, and present a selected bibliography of articles on mental tests.

K. M. DALLENBACH. *Blindfold Chess: The Single Game.* Reprinted from Studies in Psychology, Titchener Commemorative Volume, 214–230.

A masterly analysis of the thought activities involved in this most intricate of reasoning games, and a detailed description of the controls employed when the customary visual control was removed.

JOHN DAVIDSON. *Means and Methods in the Religious Education of the Young.* New York: Longmans, Green and Company, 1917. Pp. viii, 152. $1.00.

This book was written as a guide for Sunday School teachers and emphasizes the need for teaching religion, habits of right thinking and feeling, the treatment of the miraculous, the parables, story-telling, aims and modes of questioning, and the use of pictorial illustrations. The procedures recommended are frequently illustrated by examples.

Educational Survey of the Public Schools of Brookline, Mass. Published by the School Committee, 1917. Pp. vii, 436.

The survey briefly reports the application of the following tests: The Courtis Arithmetic Test, Series B; the Stone Reasoning Test; spelling tests from the Ayres scale and the Boston lists; the Ayres handwriting scale; the Holmes reading tests; and the Harvard-Newton composition scale. A demonstration school is urged. which shall combine the functions of a model and an experimental school.

A. CASWELL ELLIS. *The Money Value of Education.* Washington: Bureau of Education, Bulletin, 1917, No. 22. Pp. 52. Fifteen cents.

This is a striking presentation of the value of education to the nation, to the community, and to the individual. The study is graphically illustrated, and contains a bibliography of seven pages.

J. BERG EISENWEIN and MARIETTA STOCKARD. *Children's Stories and How to Tell Them.* Springfield, Mass.: Home Correspondence School, 1917. Pp. xiv. 352. $1.50.

This valuable manual for teachers contains a discussion of the place of stories in child life, the selection and structure of stories, methods of story telling, inventing stories and teaching children how to invent them, and fifty stories to tell to children.

J. ROGUES DE FURSAC. *Manuel de Psychiatrie.* Paris: Librairie Felix Alcan, 1917. Pp. vii, 509. Fr. 7.

This is the fifth edition of this celebrated *Manuel*, and in its revised and augmented form it will probably see as many years of usefulness as it has in the past. The first part of the book is devoted to general psychiatry, and deals with the causes, symptoms and treatment of mental disturbances. The second part treats of specific psychoses.

ARTHUR I. GATES. *Recitation as a Factor in Memorizing.* Archives of Psychology, No. 40, September, 1917. Pp. 104. $1.00.

An important study of the value of learning by reading as compared with learning by recitation in the case of elementary school pupils and university students. The first twenty pages review the work of previous investigators, the next forty pages describe the experiments and give the results, and the last forty pages present an analysis of reading and recitation as factors in learning. The best procedure was found to be to devote from twenty to forty per cent. of the time to reading and the remainder to recitation.

M. ANNIE GRACE, EMMA C. MONROE, and others. *Lessons Plans in Fourth Grade History.* Baltimore: Warwick and York, 1917. Pp. 155. Seventy-five cents.

Detailed lesson plans for a wide range of historical topics from the Trojan War in Asia to the French and Indian War in America. This book not only presents history, but shows just how to treat the topics to produce the most effect with young pupils. A mine of helpful suggestions for the elementary teacher.

F. M. GREGG. *Hygiene as Nature Study.* Peru, Nebraska: Published by the author, 1917. Pp. 170. Seventy cents.

This admirable little compendium prrovidee in compact form just those things that the teacher needs to present to a class of V to VIII grade pupils. There is no platitudinous moralizing, but the attack is strictly scientific. A feature of the book are the numerous drawings for blackboard sketches. Many simple experiments suited to elementary grades are described.

PERCY GARDNER. *Evolution in Christian Doctrine.* New York: G. P. Putnam's Sons. 1918 Pp. xiii, 241.

The author claims to stand as a connecting link between the old broad church and the new modernism. He frankly accepts evolution in science and critical method in history, and asks that the fundamentals of the Christian religion be examined afresh and restated in conformity to the intellectual requirements of the age. Especially does he feel the need for raising the intellectual standard of the clergy. In this book he traces the evolution of Christianity, and considers from the evolutionary point of view such doctrines as miracle, prayer, the immanence of Christ, the Holy Spirit, the future life, and other points of the creed. While scarcely radical enough to satisfy the thorough-going social psychologist, the book is a goodly step in the right direction.

A. J. GRANT. *A History of Europe.* New York: Longmans, Green and Company, 1917. Pp. xiv, 778. $2.75.

This is a revised edition of a well-known and highly esteemed text-book on European history. It is to a large extent a political and social history, and thee narrativ

moves with a vigor and directness that enthralls the attention and captivates the imagination. Of especial interest are the chapters on the development of Europe since 1870, the Balkan wars, and the causes of the present war of nations.

JOHN RICHARD GREEN. *A Short History of the English People.* Revised and Enlarged, with Epilogue to 1914, by Alice Stopford Green. New York: The American Book Company, 1918. Pp. iv, 1039. $2.00.

This new and enlarged edition of Green's "English People" is particularly timely, and should find a cordial reception. The clarity of Green's style and the breadth of his interests have long been recognized, and have given his work its well-merited preeminence among histories of England. In the present edition the epilogue, by his daughter, occupies almost 200 pages and brings the narrative from 1815 down to 1914. We recommend the book most highly to our readers.

ALBERT BUSHNELL HART. *School History of the United States.* New York: The American Book Company, 1918. Pp. 505, xxxiv. $1.20.

In this admirable text for the upper elementary grades the author has endeavored to bring out the European background of our history, to give due consideration to the history of different parts of the country, to stress the social and industrial development of the country, and to give a clear idea of the way our government is carried on. A third of the book is devoted to the period since the civil war, and a special effort is made to familiarize boys and girls with problems which they will be called upon to face. The book is a magnificent example of the printer's art, containing excellent maps, many full-page illustrations in color, and a very great number of small illustrative insets.

WALTER MORRIS HART, Editor. *English Popular Ballads.* New York: Scott, Foresman and Company, 1916. Pp. 370. Forty cents.

The real spirit of a people is perhaps best seen in its ballads, and this little book renders valuable service in making these English ballads accessible to the many. A helpful feature of the book is the forty-page introduction.

C. GASQUOINE HARTLEY. *Motherhood, and the Relationship of the Sexes.* New York: Dodd, Mead and Company, 1917. Pp. 402. $2.50.

The relation of the sexes is becoming one of the greatest social and political problems of the day. Six millions of women have just been enfranchised in England; the suffrage amendment is being debated in America; Norway, Finland and Australia have led the way in the suffrage movement; large concessions to women are in sight in France, Russia, and Hungary; and even in Germany three powerful women's organizations are starting an agitation for suffrage, in spite of the imperial command not to raise this question until after the war. This political recognition is merely the reflection of the economic and social evolution that has been going on for a long time. But the readjustment of the sexes brings forward with new insistence some of the oldest and most puzzling social problems that have vexed human minds. These problems find clear, scholarly and convincing treatment in the present book. The author takes the biological method of attack, and traces parenthood in insects, reptiles, fishes, birds, and mammals, showing the increasing significance of maternal care. A section on the mother in the primitive family leads to the consideration of the modern woman, the family, the home, marriage, sexual relationships outside of marriage, the unmarried mother, and the necessity

for sex education. The three chapters on the latter subject are singularly wise, sane, and well-balanced. The book is a noteworthy contribution to a vital topic.

JOEL HATHAWAY. *Modern French Stories.* New York: The American Book Company, 1916. Pp. 220.

As a result of the war there will doubtless be a marked increase of interest in the study of French in the schools, and these charming stories will aid greatly in developing vocabulary and feeling for good French idiom.

FREDERICK HOUGHTON. *First Lessons in English for Foreigners in Evening Schools.* Pp. 150. *Second Book in English for Foreigners in Evening Schools.* Pp. 180. New York: The American Book Company, 1917.

These two books contain not merely well-organized lessons in English but much useful information for foreigners in regard to the geography and industries of this country and the daily life in the city.

G. E. HUBBARD. *From the Gulf to Ararat.* New York: E. P. Dutton and Company 1917. Pp. xv, 273. $3.50.

This is an entertaining account of the activities of the Russo-British commission to establish the Turko-Persian boundary just before the outbreak of the war. As the author travelled over much of the ground since made famous by the disaster at Kut-el-Amara and the subsequent capture of Bagdad, his description throws much light on those gruelling campaigns. The abundance of photographic illustrations with which the book is supplied adds greatly to its charm.

HENRY J. HUMPHSTONE. *Some Aspects of the Memory Span Test: A Study in Associability.* Philadelphia: The Psychological Clinic Press, 1917. Pp. 31.

This monograph is number seven of the University of Pennsylvania Experimental Studies in Psychology and Pedagogy. The purpose of the study was to see how the memory span could be employed for diagnostic purposes. Results were obtained from almost 8,000 boys and girls in six public schools. The author presents detailed tables of his findings, and indicates the distribution of the memory span at each age. The median varied from four at age five to eight for adults. The Pearson coefficient of correlation between memory span and age was 0.4956. There were no sex differences, and no correlation between memory span and school standing.

SETH K. HUMPHREY. *Mankind: Racial Values and the Racial Prospect.* New York: Charles Scribner's Sons, 1917. Pp. xvi, 223. $1.50.

This is a fascinating study of the leading races of western Europe engaged in the present war, and of the fusion of these and other races now going on in America. The author begins with an account of the principles and significance of inheritance, basing his discussion on the work of Galton, Bateson, Pearson, Davenport, Castle, Conklin, and others; considers the essential elements of racial values, the criteria of superior and inferior races; passes to an analysis of the racial traits of the nations now at war; and finally evaluates the racial factors that enter into our own heritage. His comments upon the racial characteristics of France, England, and Germany are trenchant, illuminating, and remarkably free from bias. Especially interesting is his account of the German naivete, consciousness of youthful power, egotism, and insufferable domination. For our own "Melting Pot" the author has only the gloomiest misgivings. Far from developing a new and improved type of civilization, our race mixture can only result in "mongrelism" and decay. Particularly to be

deplored is the race mixture of black and white, which is going on so rapidly that there will soon be no pure blacks left. but a continually increasing infusion of black blood and black traits in the entire population of the land. While not all at flattering to American optimism and complacency, the author's observations are shrewd and biologically well-founded. It is a book to be read and pondered.

JOSEPH JASTROW. *The Psychology of Conviction.* Boston: Houghton Mifflin Company, 1918. Pp. xix, 387. $2.50.

"The subject of this volume is concerned with the interaction of our logical and our psychological nature. It attempts to deal with the psychology of our most complex logical products. It follows the 'case' method as the only pragmatic procedure, the only one that does justice to the rich content of a concrete issue. In the course of the analysis principles emerge and are emphasized; as in a trial at court, the judge and jury, though concerned with evidence and argument, are guided by principles." The first two chapters deal with the general psychology of conviction, the evolution of belief, the nature, sources and types of credulity, and outline some of the chief cases to be considered in detail. Among these are the belief in the supernatural, with especial reference to the history of Paladino; the history of the study of temperament, with particular attention to phrenology; fact and fable in animal psychology, with consideration of 'malicious animal magnetism' and its incorporation into Christian Science doctrine; the psychology of indulgence, with attention to the crusade against the use of alcohol and tobacco; the feminist movement; and the present tremendous conflict between militarism as represented by Germany and pacifism as set forth by President Wilson. In connection with the latter topic, speaking of the toleration which in normal times is good-naturedly shown to even wild vagaries of belief, the author says: "A flagrant violation of this tolerance appears in the suit instigated by the anti-vivisectionists against the Red Cross organization to prevent the use of funds in the interests of medical research; and that means to mitigate the sufferings and save the lives of the victims of war. To push a private prejudice against a public interest at this time and in this manner is an ignorant, obstinate and malicious attack, inhuman and unpatriotic even though sincere; it is a tragic demonstration of the menace that lies in unreason. Though exceptional, the instance should be used to strengthen the forces of reason and loyalty."

THOMAS JESSE JONES. *Negro Education. A Study of the Private and Higher Schools for Colored People in the United States.* Washington: Bureau of Education, Bulletin, 1916, Nos. 38 and 39. Two volumes. Vol. I, Pp. xiv, 423. $1.00; Vol. II, Pp. v, 724. $1.25.

These two stately volumes with their hundreds of illustrations afford an admirable survey of colored education in the United States. One of the most interesting chapters is devoted to the history of negro education. The second volume describes the facilities for negro education by states.

CHARLES HUBBARD JUDD. *Psychology: General Introduction.* Second edition, completely revised. Boston: Ginn and Company, 1917. Pp. xix, 358. $1.80.

This standard and widely used textbook shows a well-marked evolution in the revised edition. The consideration of conscious activities has been further developed, and more stress is laid on the applications of psychology. Unfortunately the author has not yet emancipated himself from the traditional atomistic conception

of instinct, which allows him to speak of the "development of habit through conflict of instincts." The chapter on speech, one of the best in the book, remains practically unchanged, while that on voluntary action has been much amplified and extended. While the tone of the discussion is strongly behavioristic, consciousness is by no means ignored or belittled.

I. L. KANDEL. *Federal Aid for Vocational Education.* New York: Carnegie Foundation for the Advancement of Teaching, Bulletin No. 10, 1917. Pp. vi, 127.

The first part of this work gives the history of federal aid to education in this country, Part II a detailed account of the constitutional points involved, and Part III recent movements for federal support of agricultural and industrial education.

CALVIN NOYES KENDALL AND FLORENCE ELIZABETH STRYKER. *History in the Elementary School.* Boston: Houghton Mifflin Company, 1918. Pp. viii, 135. $0.75.

It is indisputable that until recently the subject of history has received insufficient attention in American elementary schools. There is no subject which lends itself better to the development of patriotism and a keen appreciation of the advantages and needs of the time in which we live. With the appearance of vastly improved texts in elementary history, and the stress of the present war, the subject should occupy a greater proportionate place in the elementary course. The present little book contains excellent suggestions for the teacher of elementary history. These cover the use of the text-book, the assignment of lessons, study, outside reading, outlines, illustrative material, dramatization, debates, and correlation with other subjects. The book contains many hints for supplementary reading and source materials.

EDWIN A. KIRKPATRICK. *Fundamentals of Child Study.* New edition, revised. New York: The Macmillan Company, 1917. Pp. xxiii, 380.

The principal changes in the third edition of this widely-used book are the transposition and expansion of the chapter on heredity, the omission of the one on the classification of instincts, and the inclusion of selected references from the rapidly growing literature on the subject. The book still remains a treatise on instincts, and in view of the growing skepticism with which psychologists regard this concept it is bound to offer a challenge to the critically-minded. Why the classification of primitive types of behavior was omitted is by no means clear, for certainly no other part of the book has been so widely quoted.

SIR OLIVER LODGE. *The War and After.* New York: George H. Doran Company, 1918. Pp. xiv, 252. $1.50.

"In this book the author takes stock of the past and present and scans the future with relations to the war and to Germany." In the past he notes the increasing materialism and revolt against Christianity in Germany, pictures the prevailing philosophy of life held by the thinkers of Germany, and contrasts fundamental attitudes on life problems in Germany and England. In the present there is a discussion of the nature and effects of war, and the good that can be derived from war if the proper standpoint is taken. In the future the author foresees social and industrial unrest and calls upon the English upper classes to face the issue fairly and through emphasis on a broad education to develop a sense of social solidarity that will conserve the spiritual values of mankind.

CHARLES T. LORAM. *The Education of the South African Native.* New York: Longmans, Green and Company, 1917. Pp. xx, 340. $2.00.

This is the most thorough, scholarly and scientific study of the education of the South African that has yet been made. There is a history of racial relationships in South Africa, an account of the attitude of the whites toward the question of education, a description of the present systems of education, a comparison of the attainments of Europeans, Indians and Natives on the basis of tests in arithmetic, and a plan for a reconstruction of native education. There is frequent reference to the literature of the American Negro, and the progress recently made in Negro education in the South is adequately considered. It is a significant contribution to an important social and racial problem.

G. W. A. LUCKEY. *Essentials of Child Study.* Chicago: The University Publishing Company, 1917. Pp. 219.

This is a series of lecture notes that have grown out of a course in child study that the author has given for the past twenty years. Among the topics considered are the nature and importance of child study, the physical development of the infant, sense discrimination, the feelings, knowing, willing, children's drawings, the beginnings of language, crying and laughing, children's interests, and methods of child study. Valuable features of the book are the extensive lists of references at the end of each chapter and the report of material collected from classes.

EMMA O. LUNDBERG. *A Social Study of Mental Defectives in New Castle County, Delaware.* Washington: Children's Bureau, Publication No. 24, 1917. Pp. 38.

The author finds that of the 212 cases of mental defect studied 82.5 per cent. needed special care, and that over half of these are now at large in the community without any care. The evils of the situation are cogently pointed out, and constructive suggestions are made for improvement.

FRANK E. LUTZ. *Fieldbook of Insects, with Special Reference to Those of Northeastern United States, Aiming to Answer Common Questions.* New York: G. P. Putnam's Sons, 1918. Pp. x, 509. $2.50.

This splendid fieldbook is of proper size to fit the pocket, is conveniently arranged for both scientific and practical needs, and is richly illustrated with plates in color. No more useful or stimulating present could be made to the child just developing an interest in moths and butterflies than this volume. Such a book might well lay the foundation for an illustrious career of scientific investigation.

R. R. LUTZ. *Wage Earning and Education.* Cleveland: The Survey Committee of the Cleveland Foundation, 1916. Pp. 208. Fifty cents.

In this volume we find a summary of the detailed reports on several of the leading industries of Cleveland. The first hundred pages discuss various types of educational organization that may be utilized in the preparation for wage earning. Amongst these are industrial training in the elementary school, the junior high school, technical high schools, continuation and technical night schools, and vocational schools for girls. The volume is an important contribution to both the theoretical and practical aspects of industrial education.

ELMER A. LYMAN AND ALBERTUS DARNELL. *Elementary Algebra.* Cincinnati: The American Book Company, 1917. Pp. vii, 503.

This text does not aim at novelty, but is designed rather to meet the needs of ordinary teachers who expect to drill on the conventional topics, and get as many

of their pupils "through" the college entrance examinations as possible. There is a chapter on graphs, which the teacher is invited to omit if he so desires. Toward the end of the text there is also a chapter on the graphical solution of equations, but it is the exceptional teacher with exceptional pupils who would ever get that far along in the book. The problems are abundant and furnish excellent opportunities for drill.

PATRICK MACGILL. *The Brown Brethren.* New York: George H. Doran Company, 1917. Pp. 296. $1.35.

This is a tale of the trenches, in which the fortunes of a group of London Irish are followed through a year and a half, and the life of the ordinary Tommy is revealed in story form. In the course of the tale the author brings out the varying aspects of modern military life, the humor and good comradeship under privation and suffering, the strain of being under fire, the wild dare-deviltry of the charge, the nonchalant familiarity with death, the relaxation in the billets behind the lines, and the romance with the peasant girls. The book makes the life "over there" very realistic.

F. SCHUYLER MATHEWS. *Fieldbook of American Trees and Shrubs.* New York: G. P. Putnam's Sons, 1915. Pp. xvii, 465. $2.50.

Most educated Americans are singularly ignorant of the life immediately about them. The nature study movement in the schools is making an effort to counteract this by teaching the children some of the more obvious things about their environment, but this is not carried on either very extensively or very intensively. It is a distinct satisfaction to be able to identify the trees that one observes, and this fieldbook will be of great assistance in that effort. There are sixteen full page illustrations in color and fifty in crayon, not to mention the great number of drawings of leaves, fruit, bark, etc. After a little practice one should be able to identify with the aid of this book almost any tree that one comes upon.

MARK A. MAY. *The Mechanism of Controlled Association.* Archives of Psychology, No. 39, August, 1917. Pp. iv, 74. $0.75.

What is the exact mechanism of the control of ideas? This is an experimental study of the nature and effects of preparatory "set." The author distinguishes a fore-period, from the appearance of the task word to the appearance of the stimulus word, a main-period, from the stimulus to the response, and an after-period, continuing for some seconds after the response. The greater part of the investigation was devoted to the time relations of these three periods.

CARDINAL MERCIER. *The Origins of Contemporary Psychology.* New York: P. J. Kenedy and Sons, 1918. Pp. xii, 351. $2.25.

The first edition of this book was issued in 1897, and the present version was translated from the second Belgian edition of 1908. The author first expounds the philosophy and psychology of Descartes, then considers Spencer, Fouillee, and Wundt as masters of contemporary psychology, traces the growth of the experimental movement to 1908, and shows that this has nothing to do with the soul but is rather a branch of anthropology. For the genuine doctrine of the soul Aristotle and St. Thomas Aquinas remain the best authorities, and there is little difficulty in reconciling orthodox belief with the results of experimental investigation. Hence Catholics are urged to participate in these experimental studies, and to enlarge the boundaries of the science of man, rather than to act in opposition to this tendency.

HOLMES W. MERTON. *How to Choose the Right Vocation.* New York: Funk and Wagnalls Company, 1917. Pp. x, 302. $1.50.

The author styles himself "Vocational Counselor," and pretends to suggest "a large number of interesting mental 'tests' which enable one to self-chart one's vocational aptitude." As an illustration, he states, "Form ability makes one conscious of the shape, outline and individuality of objects," and then proceeds to ask a list of questions, such as "Do I actually see the specific projections as well as the general contours and outlines of objects," and expects the reader to decide from his own answers whether he is fitted to be a sculptor, a penman, a photographer or a blacksmith. It is a sad commentary on the intelligence of the public that such travesties have any readers.

C. N. MILLARD. *A Parent's Job.* Boston: The Pilgrim Press, 1917. Pp. ix, 227. $1.00.

Too much of the responsibility for the education of children is shifted from the parents to the schools, according to the author. Therefore it is necessary that the school plan deliberately to enlist the co-operation of the parents, and to induce them to assume their share of the burden. The last half of the book is devoted to a detailed discussion of the school work that should be carried on in grades one to eight.

WALTER S. MONROE. *Second and Third Annual Reports of the Bureau of Educational Measurements and Standards.* Kansas State Normal School: Studies, by the Bureau of Educational Measurements and Standards No. 6, 1917. Pp. 80.

This monograph gives the results of recent studies in arithmetic, spelling, silent reading, visual vocabulary, handwriting, and algebra carried out under the direction of the Kansas Bureau of Educational Measurements.

E. L. C. MORSE. *Spanish American Life.* Chicago and New York: Scott, Foresman and Company, 1917. Pp. 369.

The incidents in this Spanish reader are derived from the best journalistic sources in Spanish-American countries. The selections are taken from Mexico, Cuba, Argentina, and the western coast of South America. They thus give a better idea of Spanish-American life than the ordinary selections from Spanish literature.

E. H. MULLAN. *Mental Status of Rural School Children.* Washington: Reprinted from the United States Health Reports, November 17, 1916. Pp. 30.

This report deals with the results of Binet and other tests in New Castle County, Delaware, and Porter County, Indiana. It is found that in the country, as in the city, a considerable percentage of the children (perhaps two per cent.) are so retarded mentally as to be unable to profit by the regular instruction.

One Year of Compulsory School Attendance in Maryland, 1916–17. Baltimore: State Board of Education, 1917. Pp. 55.

A detailed statistical account of the measures taken for the enforcement of the compulsory education law, and of the results by counties.

A. N. PALMER. *Standards for the Evaluation of Efficiency in Palmer Method Handwriting.* New York: The A. N. Palmer Company, 1917.

This is a series of eight standards to be used one for each grade of the elementary school in estimating proficiency in handwriting. Each sheet contains five or six

specimens ranging from very good to very poor work for that grade, and each sample is evaluated on the basis of posture, movement, speed and formation. The ratings given seem to be entirely arbitary, and probably stand for the best judgment of the author. It is an interesting attempt on the part of a commercial system of handwriting to supply a scale to measure the value of the product.

FRANKLIN C. PASCHAL. *The Witmer Cylinder Test.* Hershey, Penna.: The Hershey Press, 1918. Pp. 54.

This test was adapted as a measure of intelligence from the Montessori cylindrical insets, and the present monograph gives an account of its standardization on 2230 individuals. The method of giving the test is carefully worked out, and extended tables and graphs are given showing the distribution of results. The author considers the test peculiarly adapted to the determination of the degree of distributive attention of the individual.

HENRY CARR PEARSON AND MARY FREDERICKA KIRCHWEY. *Essentials of English.* New York: The American Book Company. First Book, Pp. xii, 308. Second Book, Pp. xii, 454.

The first book is intended for use in the fourth, fifth and sixth grades, and is based on the principle that the best way to train pupils in the use of English is to have them use it. Hence, abundant provision is made for oral and written composition, for practicing the correct use of forms, for letter writing and for the use of different parts of speech. In the second book the idea of applied grammar is carried further, and exercises are given for developing facility in those forms and constructions in which mistakes are frequently made.

BENJAMIN FLOYD PITTENGER. *The Efficiency of College Students as Conditioned by Age at Entrance and Size of High School.* Sixteenth Yearbook of the National Society for the Study of Education, Part II. Bloomington, Ill. Public School Publishing Company, 1917. Pp. 112. $0.75.

High school graduates entering college before 18 do better work than those entering later, and those entering after 19 do poorer work than those entering earlier. Graduates of public schools did better than graduates of private schools. Schools enrolling from 21 to 30 pupils per teacher produced better college students than those with fewer or more pupils per teacher. Women entrants are superior to the men in both scholarship and retention, but there is little difference between those who finish the college course.

MABEL POWERS. *Stories the Iroquois Tell Their Children.* New York: The American Book Company, 1917. Pp. 216.

These wonder and fairy stories were collected by the author from the scattered descendants of the once powerful Iroquois, and are here retold for the benefit of children and grown-ups who are interested in genuine American fairy tales,

Practice Teaching for Teachers in Secondary Schools. Washington: Bureau of Education, Bulletin, 1917, No. 29. Pp. 82. Ten cents.

This monograph is largely the result of the work of a committee of the Society of College Teachers of Education, and was prepared under the supervision of Professor A. R. Mead, chairman of that committee. It contains reports from the leading institutions of the country on the work in practice teaching and studies of the results of this training on the efficiency of teaching and on the pupils taught.

SOPHY H. POWELL. *The Children's Library, A Dynamic Factor in Education.* New York: The H. H. Wilson Company, 1917. Pp. xiv, 460. $1.75.

We are only beginning to appreciate the significance of reading as an educational instrument. Especially in the lower grades the custom is still prevalent of keeping the children for an entire term on a single book, subordinating real interest in reading to drill on the pronunciation of words. Some time we shall appreciate the necessity of having a library in connection with every school, and each child will be expected to read from five to twenty books in a term. The present book will afford valuable information for the selection of these libraries. There are chapters on libraries for elementary schools, high schools, rural schools, the relation between the public library and the schools, the training of the children's librarian, and the selection of books for children. A very useful part of the book is the bibliography, extending over more than 100 closely printed pages.

H. O. RUGG. *The Cost of Public Education in Grand Rapids.* Pp. 361–475.

This is an extract from an extended report on the Grand Rapids schools, and gives tables and graphs of expenditures for education in Grand Rapids compared with those of other cities of like size. It is valuable for students of educational finance.

LEROY W. SACKETT. *Comparable Measures of Composition.* Reprinted from School and Society, Vol. 5, 1917, 233–239.

The author gives an account of grading a series of compositions by four different methods, and contends that better results are achieved by a score card than by either the Hillegas or the Ballou Scales.

ANNA TOLMAN SMITH AND W. S. JESIEN. *Higher Technical Education in Foreign Countries. Standards and Scope.* Washington: Bureau of Education, Bulletin, 1917, No. 11, Pp. 121. Twenty cents.

An account of the organization and equipment of the higher technical schools of the chief countries of Europe, Asia, and South America. A very important document in view of the industrial reorganization that may be expected after the war.

ALICE TEMPLE. *Survey of the Kindergartens of Richmond, Indiana.* Supplementary Educational Monographs, No. 6. Chicago: University of Chicago Press, 1917. Pp. v, 58. $0.40.

This survey brings out once more the absurd fashion in which many communities handicap their bright children. By a state law no children in Indiana are allowed to enter the first grade until they are six years old. But many bright children entering the kindergarten at four or four and one half are ready for the first grade in one year. Instead of advancing according to their capacity, these children are compelled to mark time, with all of its deadening monotony. Of course the enterprising superintendent might give these children first grade work in the kindergarten and advance them correspondingly in the elementary grades, but this is not easy to manage in crowded schools. The surveyer found the customary lack of articulation between the kindergarten and the first grade, chiefly because of the inflexibility and unnaturalness of first grade teaching.

LEWIS M. TERMAN. *The Intelligence Quotient of Francis Galton in Childhood.* Reprinted from the American Journal of Psychology, 28: 1917, 209–215.

On the basis of the data presented in Karl Pearson's *Life, Letters and Labors of Galton*, Professor Terman finds that Galton was distinctly an infant prodigy, with an intelligence quotient of perhaps 200.